

Aviation Week

and Space Technology

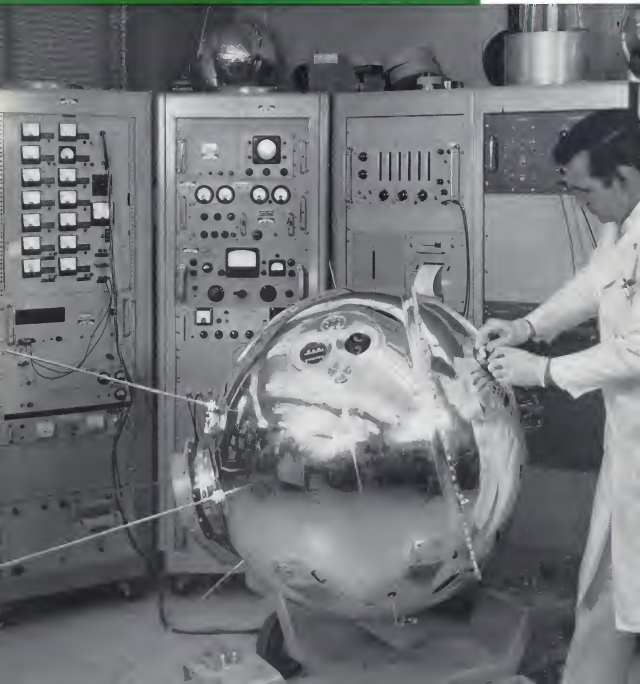
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A McGraw-Hill Publication

January 1, 1962

**S-6 Satellite
Will Study
Atmosphere**

NASA S-6 Geophysical
Satellite Prototype



COOL HEADS for HOT SPOTS



(Or: The Sliving Saga of Sulfur Hexafluoride Subdroid)

Over coffee one recent morning (see engineers sleep right in thinking during coffee hours), we observed one of the shining lights of our Environmental Control Systems Department stating a gas that can be described only as Chthonian. Ignoring previous experience under the starburst of power curiosity, we inquired into the cause of his bliss.

Seems that the defective properties of our secret gas were enough for it to be used as a pressurizing gas for many of the high-power waveguide systems being used today. The best job is done by SF₆—a gas that packs 2 to 3 times the dielectric strength of air at normal pressure, and even more at higher pressures.

Ah, but there's a rub (that is, there *was* a rub). If you want to depend on SF₆, you have to keep it pure. Anhydrous or anhydrous discharge decomposes the gas, and the decomposition products would eat the inside right off your furnace case. The gas must be constantly recirculated to remove these corrosive products. And moisture, another troublemaker, must also be eliminated.

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manually regulates supply, compensating for normal leakage in the waveguide. . . and maintains both required purity and dryness. Its automation system (relative to ours) delivers reliable, continuous free-operation and long service.

At this point, one of our teenage thebes we should remind you that our Environmental Control Systems Department didn't get into SF₆ handling by accident. We've been designing and manufacturing best discharge systems, refrigerators and air conditioning systems and pressure distribution for electronic equipment for over 20 years. If you've got an equipment or tube cooling problem, space ground or sea . . . or an operating gas problem with waveguides, cryogenics, rotary joints, causal lines or similar components, it's a sure bet you should know more about our current activities. Write Environmental Control Systems, Budd Electronics, 43-20 Queens St., Long Island City 3, N. Y.

*Full D knowledge for qualified clients.



Budd Model PHD-2000 SF₆ Handling System

Data Processing/Backup Systems
RF Systems • X-Ray Systems
Environmental Control Systems
Test Facilities Engineering

Budd ELECTRONICS
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AEROSPACE CALENDAR

(Continued from page 1)
ment of the Interior, Antioch, Wash.
region. D. C. Sperry, Information Systems Branch, Office of Naval Research
Feb. 18-19-Third World Conference on Military Electronics, IRE, Anaheim Hotel, Los Angeles

Feb. 19-20-International Solid-State Circuits Conference, Institute of Radio Engineers, Sheraton Hotel and University of Pennsylvania, Philadelphia, Pa.

Feb. 19-21-Trucking & Connected of Aerospace Vehicle, Institute of the Aerospace Sciences, San Francisco, Calif.

Feb. 22-Mar. 30-Third Annual Symposium on Nondestructive Testing of Aircraft and Missile Components (continued) Century Hotel, San Antonio, Tex. Sponsored South Texas Section Society for Nondestructive Testing, Southwest Research Institute

Feb. 22-Mar. 2-Indo-European on the Application of Switching Theory in Space Technology, Palo Alto, Calif. American Lockheed Research Corp., Air Force Office of Scientific Research

Mar. 1-3-Flight Simulation and Sensor System Conference, IRE, Sheraton Hotel, Washington, D. C.

Mar. 5-6-Seventh Annual Gas Turbine Conference and Products Show, American Society of Mechanical Engineers, Sheraton Hotel, Houston, Tex.

Mar. 6-10-Exhibitors of the Aerospace Society, Pasadena Meeting, Pasadena, California, Calif.

Mar. 14-16-Electric Propulsion Conference, American Rocket Society, Hotel Claremont, Berkeley, Calif.

Mar. 15-16-International Conference on Status of Radio Engineers, Columbia and Walden Hotel, New York

Mar. 15-16-Third Symposium on Engineering Aspects of Magnetohydrodynamics in University of Rochester, Rochester, N. Y. Sponsored American Institute of Electrical Engineers, Institute of the American Society of Engineers of Radio Engineers, University of Rochester

Apr. 1-4-Mid-Year Conference, Airport Operations, General Sherman Hotel, Washington, D. C.

Apr. 1-5-Launch Vehicle Structures and Materials Conference, American Rocket Society, Anaheim Inn, Phoenix, Ariz.

Apr. 16-18-Vision Automatic Meeting on (including production lines) Society of Automotive Engineers, Hotel Chautauque, New York, N. Y.

Apr. 16-18-Second Symposium on the Plasma Effects on Effect Upon Reentry Communications and Detection, New York and Montreal Hotel, Boston, Mass. Sponsored by Cambridge Research Laboratories

Apr. 18-19-Southeastern Conference and Electronics Show, Institute of Radio Engineers, Ritz Hotel, Birmingham, Ala.

Apr. 19-20-Second International Flight Test Symposium, Syracuse, College of Aeronautics, Cranfield, England

Apr. 20-21-Advanced Systems Technology Symposium, Institute of the Aerospace Sciences, Hill Lake, Calif. 1964

Apr. 21-22-Wireless Supply Age Industries and Engineering Exposition, Cox Hotel, San Francisco, Calif.

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EDITORIAL

Changing Patterns

This year will be characterized by basic changes in the patterns of business in the aerospace industry that will tax individual management's flexibility in meeting out the usual indications of these shifts, and adapting their own operations to mesh with the new demands at their principal customers.

Since about 1970, as the aerospace business is transacted with various branches of the U.S. government, the major impact on these changing patterns will come from the emergence of the philosophy, methods and executive personalities in the Kennedy Administration. This Administration, with a full year of grappling with the problems of organizing an effective political machine at the same time it was being belted solidly and repeatedly by international crises ranging from Cuba to the Congo, is now settling down into a pattern of attempting to secure the initiative and progressing positive action instead of being confined to ad hoc responses to the stimuli of continued crises.

The aerospace industry will need considerable intelligence on these developments, swiftly and accurately transmitted, if it is to adjust its operations to meet the new requirements of the customer. At the same time, all of aerospace industry, but the aerospace segment particularly, should be getting now for a tough battle with the Kennedy Administration along the entire front of the government-industry interface, with such key areas as patent policy, and government regulations likely to be the hottest waters. Unless the aerospace industry develops a strong, legitimate position and effectively projects it to both the Congress and the American people, it is likely to come out of the next round of government battles badly humiliated and in a weakened, lessened position from which it could become extremely difficult to establish the blistering technical pace required, with its management reduced to messenger boys for the Pentagon.

AIA Needs Modernizing

In telling its story to the American public, the aerospace industry faces an admittedly difficult task, for which there are no quickly conceived or easily executed solutions. But it is a task that must be undertaken immediately or the cumulative results over the next few years could easily be disastrous, both for the aerospace industry and the nation that depends on it. Carefully see of the places to begin this task as is making the entry and out of the Aerospace Industries Association. Association and adapting it to meet the industry's needs of today and tomorrow, rather than continuing in the well-worn rut of yesterday. Fortunately, the new AIA president, August C. Eckenrode, brings to his post a long background in practical engineering and manage-

ment in the industry and is free from the constraints that inevitably inhibited the line of retired military officers who preceded him.

But AIA and the other trade associations such as the National Aeronautics Society, the Electronic Industries Assn., etc., cannot do the whole job. If they have no significance and also that they can provide a considerable amount of the vastly needed intelligence and staff work that must be the foundation of any solid industry campaign. But it will also take considerably more attention from the top management in the aerospace field. In the past, these leaders have been overly concerned with playing a purely defensive game and making their points only when summoned before congressional committees with a hidden hand attitude. If this ever was effective strategy, and we personally doubt it, the time has long since passed and a more forceful and persistent strategy is required.

It will also require many of these leaders to sub ordinate their personal notions and prejudices in the interest of a more unified and thus more effective industry position behind the key redoubts that must be held against the impending assaults by government.

Merger Yogue in Doubt

Changing patterns loom also for the air transport industry, where the impact of jet technology and the consequences of a given capacity are in search of a worthwhile mass market. We somehow feel that mergers, offered as a panacea for all that ails the air transport industry, do not really offer as much of a solution as they appear to now. The more the problems go deeper and deeper and require much more fundamental analysis and action than merely combining individual airline problems under a larger tent.

Jet technology has provided the air transport industry with the fastest and swiftest transportation in history, and it is the problem of airline management and the government regulators bodies that affect them to strive toward more basically new solutions that are as fresh and revolutionary as the technology that created them. The jet age has confronted the air transport industry with a revolution, not just another of the evolutionary steps that marked its progress for the past four decades. Its problems will not be solved without developing some definite changing patterns in operations, sales and management.

Thus it appears that 1962 truly will be a year of pattern changing, fundamentally across the entire spectrum of the aerospace field, and vertically within the individual organizations that constitute it as they meet with various crises and intelligence to the problems that will inevitably confront them.

—Robert Hays



WHO'S WHERE

WHERE IDEAS UNLOCK THE FUTURE



The BENDIX Q-30 digital computer system is the heart of the new Bendix Computing Center at Ann Arbor, Michigan. On the right, above, is a close-up view of the system's PDP-7 mainframe, which is a large, modular unit that can be configured to meet the needs of a wide variety of applications. The computer is designed to handle a wide range of tasks, from data processing to scientific calculations. The system is housed in a large, industrial building with a high ceiling and a concrete floor. The cabinets are made of metal and have a dark finish. The man is wearing a dark suit and a white shirt. He is looking at the cabinets with a serious expression. The overall atmosphere is one of a high-tech, professional environment.



COMPUTER ENGINEERS experienced in computer integration for large-scale systems, logical design techniques, computer programming, data reduction, analog and digital simulation, computer analysis or display and control equipment design will find new careers at the Bendix Computing Center. Write or call Personnel Director, Bendix Systems Division, Ann Arbor, Michigan—an equal opportunity employer.

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Washington Roundup

Manned Spacecraft

A critical new look is being taken at the military potential of manned, man-steerable space vehicles. A "white paper" on the subject is being prepared now in the office of the Director of Defense Research and Engineering. It will be sent by Secretary Robert McNamara to existing law and decision on how much of a military requirement really exists in this area and to support his discussion with National Aeronautics and Space Administrator James Webb on the general military role in the national space program.

The potential of robotic military spacecraft has been reviewed recently by the House Committee (AW Sept. 11, p. 21), which attempted to formulate a unified Air Force position on space and in a special study close to the Institute for Defense Analysis. The Air Force position was presented to McNamara in November (AW Nov. 4, p. 23), before the start. NASA Defense committee on large launch vehicles had finished its work. Since the houses that will be available affect the mission that can be performed, the new review may be completed in the course of a follow-up to the earlier studies.

Two other developments indicate a brighter outlook for manned military spacepower. Defense Department's acceptance of a partially unclassified Dox-Sent project for 1960 and NASA's intention to cooperate with military at levels of the military establishment on manned space flight and reconnaissance (see p. 16). They also indicate that the growing pressure from Congress and the Administration may at last be reducing some of the inter-agency rivalry that has been out of the more obvious aspects of the space effort.

Tardy Budget

A few key decisions were still to be made on the Defense Department budget for Fiscal 1965 late last week, in spite of reports that President Kennedy had completed work on it. The budget is now three weeks beyond its normal closing time. Secretary McNamara and the Joint Chiefs of Staff are to meet with the President this week but not possible on the budget question.

Supplemental Probe

House Armed Services Subcommittee's investigation of military use of the supersonic rocket, which is scheduled to run all next week, is not expected to result in any new legislative legislation. Instead, the subcommittee probably will rely on corrective measures in Defense Department and on appropriate military legislation that already is pending before the House and Senate committees immediately.

But the hearings are bound to influence the legislation, which will decide this year what overall safe requirements should place in the transportation field. Chairman Mike Monroney of the Senate aviation subcommittee, which introduced the pending bill, is expected to argue that the requirements are because safe only after they are given the type of improvement he bill would provide.

The change in the legislative atmosphere followed the laparoscopic crash last Nov. 4, which killed 14 Air Force men. Civil Aeronautics Board's subsequent investigation revealed many questionable practices, particularly in maintenance (AW Dec. 13, p. 107). The crash affected the entire supersonic military industry at a time when it was having its own organizational difficulties, and the crash is that a number of carriers are leaving the independent Air Force line to form a new group.

No harmful outcomes will be called because CAB has thoroughly investigated the crash and because legal claims are pending against it. Air Transport Union, representing the major scheduled airlines, is prepared to testify. Lord's witness probably will be Thomas D. Mason, the assistant secretary of defense responsible for transportation policy. It will be followed by Army and Air Force officers, then private groups. The hearings are likely to compel Defense Department to make permanent some of the changes it ordered shortly after the laparoscopic crash. A major factor of that order gave Military Air Transport Service authority to decide which supplemental military military would use.

New Shelter View

An insight into the reasonable positions that President Kennedy's latest shelter program may encounter in Congress this year is contained in an American Atomic for the Advancement of Science Committee report presented to its annual convention last week. It said that "any shelter system short of one that places the nation's entire population and industry permanently underground can be regarded by a corresponding majority as the nation's panic." One problem is not the protection of a particular unit but the own business protection of many nearby firms. A potential danger that will be the reasonable future confidence to eliminate the business space's other capacities.

Explosion danger talks between American and British officials have not moved to the negotiating table. British officials also have indicated the possibility of cooperation with other current-future industries that Civil Aeronautics Board Chairman Alan Boyd's attitude on mergers and the pressure of defense measures are being taken very seriously by all the major airlines.

—Washington Staff

Dyna-Soar Decision Ends Long Impasse

By Larry Green

Washington—Desires to go directly to orbital flights with the USAF DOD Starboard glider has cooled six months of controversy in which Congress voted an extra \$85.5 million to subsidize the project. The Defense Department with-held funds while it decided the project's fate, and Boeing Co. the prime contractor, used its own funds to keep the project alive.

Division, the most often concentrated power in the military space program, trifurcates the Titan II booster, whose exact configuration has not yet been completely determined (AWF Doc 25, p. 17).

The project is unique in two aspects. It has received go-ahead at the Defense Department level without the Air Force having to pass a military acquisition for it. About a year ago, USAF was forced to try to justify the project by stating a military mission in order to keep the project alive, although it professed to consider Denza-San as an optimal research project leading to future manned space flights in microgravity vehicles.

Accepted Justification

The attempted perfection was not well received by Defense officials, and further delay resulted. Now the project is being considered a research effort only, and not military research, such as reconnaissance, that may result in the construction of a house.

To speed the project, Air Force and Boeing earlier this year proposed a "Project Streamline" which eliminated the subsonic flights. The F-15 bomber planned for these flights was not powerful enough to put what is now a \$5,000-77,000 lb vehicle into orbit, however.

NASA proposed use of its Saturn S-II booster, a cluster of eight H-2 liquid propellant engines. As Titan, which carries a relatively strengthened solid-core booster, proposed a modified Titan 2 with a high energy stage added, or a Titan 2 with solid propellant booster strapped to it as a last stage, which is now being called Titan 3.

Funds for study of the detailed design of Tyros 5 were advanced in October. The study was begun by Martin Marietta on Nov. 1 and is expected to be completed by the end of this month. The exact configuration is not yet final, but it appears that two five-gallon solid propellant motors will be installed in Tyros 2.

One reason for Air Force resistance to using the Titan 2 is that the upper

stage has a revival capability, which will permit adjustment of the orbit. Table 2 also is relatively simple because it uses straight-lined procedures.

Some NASA officials pointed out that the Saturn 5-1 is closer to operational status and that it has engine-out capabilities.

At Farn, did not consider the engine-out capability an advantage because "the offset and speed of the Dyno Star vehicle will have to be so exact that any deviation would affect the center angle, taking the vehicle out of the narrow temperature speed corridor for which it is designed."

Program Description

Reorientation of the program will delay a last flight assessment but is expected to submit flight test results later than originally estimated. The schedule will require very little modification for use with the Tutor 1. It will, however, principally increase attitude control will be necessary over a greater period of time.

What, on Title 2 booster concepts are we north Dvaadshet has been performed by about 1 000 persons at Maria Marenko's Bdransone plant. They now are performing the Title 3 booster study, and are continuing work on Title

Although the Titus 2 has been dropped as a Delta-Star booster, it still will be used by USAF for quiet missions, especially in conjunction with the

The *DreadShot* program began in 1994 with student Jack in 1995. An

Handley Page Denies Merger Talk

London—Hiroshi Fuge has won the coveted runner-up award for his work with another British aircraft firm in line with the United Kingdom's policy of promoting the exports.

A Healders Pags official told stockholders at the annual meeting that no negotiations are under way at the present time.

Handler Page has been approached by both British Aircraft Corp and Hawker Siddeley Aviation with proposals. (Hawker has been a possible Royal Air Force order for Handler Page Dart Hawks as a military transport.) Hawker and no offer has been made. They are the board to put to stockholders.

Acroprene Co., essentially a holding company with interests in Haskins Sel-

Form these teams headed by Becerra and Martin to perform detailed studies that would lead to a development contract. This lasted until the spring of 1990.

In November of that year Boeing was chosen to develop the glider and Mustang the hunter.

Although both teams had proposed use of a glider, Defense Department's research and engineering office raised the question of whether the vehicle should be a glider or a semi-ballistic shape and whether structural aspects had been studied carefully enough.

To determine which shape was preferable, Phase Alpha was integrated into the program about all new development work.

Dilute drops with a lifting ratio of one, semi-helical drops with some lift, and globular ones extremely overextended. Helical suggestions included folding wings, helical structures and use of a modified X 15

Phone: Alpha Documents

Phase Alpha produced a stack of documents 13 ft. high and concluded that the vehicle should be a glider weighing approximately 18,000 lb., with a lift drag ratio of between 1.3 and 2.5 to 1.

After development began, it became apparent that the weight of the vehicle would not permit the Titan 2 to boost it into orbit. Project Starline was proposed and accepted by Congress. Just the extra \$15.5 million was reported by the Defense Department. This was followed by the most secret considerations, which accelerated the project to meet degree but without benefit of the extra money.

delco and Diesel Söderberg Engines, Ltd., joined with Westland Aircraft, the large helicopter manufacturer to offer about \$12 million for share capital of the Fynn Co.

Proposed Seed

Deal would acquire two Bristol Aero-plane common shares and two West-land common for three Fawcett common shares.

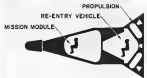
Firearm, last year designed shell of its United Kingdom subsidiary, builder of the Rotoflex VTOL, transport, to Westland.

Offer a poster advancement by Facebook.



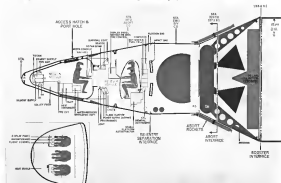
Falsely making of General Electric Appliance configuration is 14 ft. long with an 18-in. diameter at the fixed skirt. Operational speed will be approximately 17,000 ft.

GE Apollo Mockup And Configuration Detailed



Backup and shadow drawing show configurations proposed by General Electric for the Apollo spacecraft's questor, one of a number of lunar questor designs described by Dr. George R. Arfken at the American Astronautical Society Symposium on Manned Lunar Flight held Dec. 29 in Denver. The line drawing is a ground-level questor's induced profile. GE was one of three companies to conduct studies which contributed to Apollo specifications. Dr. Arfken managed the GE study effort.

Inboard profile of one laser spacecraft design shows arrangement of equipment and subsystems. One cylinder fore configuration is stable during all orbit maneuvers. Three fuel tanks take advantage of loaded core, with short rockets housed in forward section.



Kennedy Prepares Comsat Compromise

By George C. Wilson

Washington—President Kennedy is expected to plunge deeper into the communication satellite controversy within the next few weeks by sponsoring a bill designed to provide a middle ground for the private and public investment firms.

The bill, drafted by the National Aeronautics and Space Council and now awaiting the President's final approval, would allow private companies to operate the global communication system at a profit but would impose federal controls on them.

These controls are designed to protect the public interest as well as to give the federal government authority to handle dealings with foreign governments. Guidelines for the system were contained in President Kennedy's communication satellite policy statement of July 24, 1960.

"That statement called for a communication satellite system with a 'structure of ownership or control which will permit maximum possible competition.' Those who drafted the

bill for the President felt this ruled out the Federal Communications Commission recommendation to limit ownership to existing U.S. international telephone and telegraph exchange carriers. FCC guidelines in preparing its studies this summer plan to "deserving of consideration and exploration as to effective means of promoting the steady development and distribution of such a system."

The Administration's draft bill would broaden the ownership base beyond the international carriers and would limit the amount of stock any one company could own in the communication satellite enterprise. These provisions are designed also to allow firms such as the American Telephone and Telegraph Co. because of its very low, although would gain control of the system.

Although the Administration bill is still subject to revision, indications are that broadening of the ownership base will be accomplished by selling communication satellite enterprise stock to the public. Unlike the bill sponsored by Chairman Robert S. Kerr (D-Okla.) of the Senate Aeronautics and Space Sciences Committee, the Administration means would not empower the FCC to decide who should own the system. However, the FCC under the Administration bill would have certain supervisory powers over the companies.

Private Rights

Another controversial point—private rights of firms participating in the communication satellite enterprise—was not covered in the draft bill. Administration leaders felt such a provision would exclude new observers at the already rough start of the President's bill and would not be Congress.

First, congressional leaders must decide what ownership will have jurisdiction over communication satellite legislation. Sen. Kerr wrote his bill as an amendment to the National Aeronautics and Space Act of 1958, so it would be referred to his own committee. But the Senate and House Communications Committees, which have jurisdiction over the Federal Communications Commission, contend they have jurisdiction over communication satellite legislation.

Once this jurisdictional question is decided, the congressional committees will have to consider proposals ranging from complete private to completely public ownership of the communication satellite system. And even though the issue is increasingly complicated, the space race with Russia is prompting demands for an early decision so the U.S. program will be the first in operation.

The House Science and Astronautics Committee, after holding hearings on communication satellite legislation, has passed a report stating that "being first with this practical application of space technology will result in great international prestige for the U.S. Accordingly, the research and development agencies for space communications should be permitted with vigor... The committee considers the rapid development of an operational system to be a fundamental national objective, the accomplishment of which must not be unduly slowed by restriction of administrative complexity but nevertheless satisfactory conditions. Questions relating to ownership and operation of a commercial system, such as business and financial arrangements, should not be permitted to delay the research and development phase."

So far, Administration and lay organizational leaders have not yet to help give the way for the President's bill. The mortgage probably will be held after Congress returns in Jan. 1961.

An indicator of how congressional action on Oct. 11, 1960, that a majority of members of either be established in two and operate the communication satellite system (AWO Oct. 25, p. 20). Chairman Russell Collier (D-N.Y.) of the House Judiciary Committee said at the time that "excluding discussion certain equipment manufacturers and other potential participants from participating in the satellite portion of the system, thus communication would be self-sufficient, the probability of other development of the proposed system by AT&T" He added that the proposal would conflict with President Kennedy's policy statement on competition.

Although the bill has constructive purpose in still under consideration by the FCC, the fact the Kennedy Administration has written a far different proposal indicates the administration's communication has been rejected by the White House.

Fallout Advice

Washington—Defense Department is to begin distributing 25 million copies of its booklet "Fallout Protection" this week. Free copies will be available to individuals at post offices and will be distributed to schools.

All children on Main, fire damage and illness in the booklet are based on a search add of five megatons. The booklet does not discuss nuclear weapons and their effects and suggests measures to protect survivors. The booklet is an emergency shelter.



Spacephoto photo shows Minuteman ICBM launch from site at Cape Canaveral. Note exhaust gas trails (top) in first picture.

Minuteman Launch Silo Details, Test Firing Shown

Contract artist's drawing of Minuteman silo designed by Ralph M. Parsons Co. shows vehicle support on about 1 ft of the silo down the hole in digging at right. Vehicle not yet attached to one of the launchers is one of three going and linkage mechanism to select rail. Shock mounted to support equipment runs in guide launch tubes. Below it are a motor generator set and bank of batteries. Separate building to help contain noise would surround equipment and shield power. Noise power is from commercial source. The silo is about 75 ft deep.



Launch control center is shown at left. It contains communication and monitoring gear and is shock mounted on four pneumatic spring cylinders. Above, detail of left launcher, both launchers and elevators. Unlabeled pipe shown in the view of a blast is there to set up connection to the surface.



West German Fiat G.91T Trainer Displayed

The G-91T trainer is now being displayed to the West German Luftwaffe for evaluation and assessment of its performance against the NATO light tactical fighter. Vertical take-off and landing are less stressed lightly to balance out the increase forward of the center of gravity. Various problems are identified at intersection of horizontal and vertical take-off to improve load factor conditions and provide separation due to expansion along the structure. Although it is a pair of 18-oz. Browning machine guns, the aircraft was first flown May 31, 1965 and is in production for both Italian and German air forces. Present performance is within a few percentage points of the figure. Modifications to standard G-91 structure were made to forward fuselage only, instead of on changes to present structure elsewhere.

Economic Benefits of Disarmament Cited

By Katherine Johnson

Washington—United States stated that "the timing of research and development resources could be one of the most important economic benefits of disarmament" in a report submitted last week to the Secretariat of the United Nations.

The report is considered a preliminary document by the U.S., drawn with some haste in an unsuccessful effort to meet a May 15 deadline. It will be part of the worldwide study on the economic repercussions of disarmament now under way by a 50-member non-aligned group appointed by the UN Secretary-General (AW Dec. 4, p. 12).

For the most part, the U.S. document presented to the UN basic statistics on defense employment and expenditures over the past decade, which have been public information in the U.S. It noted that until the cessation and timing of disarmament and the requirements of an international peace force are known, studies of the economic impact of disarmament can only be tentative and indicative.

The Soviet Union has stated that it will submit a similar document to the UN.

"Because the area of the research and development resources which would be freed by disarmament are so important and so many, in the field, certainly, the economic benefits of disarmament would dwarf the problems," the U.S. report stated.

"The civilian economy would benefit

significantly from increased long-range research and expenditures with advanced technological problems of the sort that the research team presently employed by defense industries have conducted so successfully."

The report noted that less than 10% of the U.S. gross national product is now for defense, compared with 40% during the height of World War II, and stated that with sensible policies and advance planning, the possibility of an even larger impact on the U.S. economy can be achieved intelligently.

Specific Measures

Specific measures suggested in the report were widespread test reductions, savings from personal income taxes to cover income deficits from a nationwide employment information system, and increased federal expenditures for public works education and social housing.

The civilian space program was viewed as particularly suitable for the new and resources freed by disarmament.

"Saving programs to cure the problems of terrorism of labor and plant from defense to non-defense men, even benefit with effective fiscal and monetary policies to stimulate an aggregate demand, together would be able to keep the consumer costs of disarmament small," the report declared.

The report noted that the state of Washington has a program to survey the dependence of industry on that state on military spending, to encourage

firms to make plans for diversification, to develop plans for public works, and to analyze the need for special investment to firms and individuals in the event of disarmament.

The planning program to ease the process of disarmament is the responsibility of state and local governments, business firms, labor unions and other organizations, as well as the federal government, the report said.

Since the U.S. could accomplish a transition to a peacetime economy without an economic drop in national income, the report said, the world economy would not be threatened by a loss of U.S. markets due to a recession in that country.

While autarky, an one-of-a-kind economic program with accounts released by disarmament, the report stated that the elimination of U.S. military programs in continental Europe would be of net beneficial economic effect by wiping out the U.S. economic deficit with the region, thereby easing the current payments imbalance. The 1960 U.S. general deficit with Europe was \$205 million, compared with net military expenditures there of \$1.4 billion.

The report stated that elimination of receipts from U.S. defense installations in Canada—which amounted to \$145 million in 1960—would have a substantial effect on Canada's fiscal position, but suggested that this situation, as well as advance expenditures in other countries, could be alleviated by compensatory programs such as economic aid.

Three Nike Zeus Tests Include Intercept

Air Force Nike Zeus intercept missile was fired three times within one hour from widely separated points in mid-December. One test included the intercept of another missile.

Features of the three tests, which the Army says were successful, were the following:

- Intercept of a Nike Hercules anti-aircraft missile over the White Sands, N. M. Missile Range.
- Longest and highest flight to date by a Nike Zeus, made over the Pacific Missile Range from Ft. Meigs, Calif.
- First successful launch of the missile from Kwajalein Island in the South Pacific.

The White Sands test pitted the Nike Zeus against the much slower Nike Hercules, whose top speed is 3,000 mph. After being the Hercules was tracked by ground radar and the Zeus launched to intercept it.

The intercept occurred after the Hercules had reached its apogee and was descending in a southeasterly direction. A direct hit was not scored but the ram distance was close enough that if the Zeus had been carrying a warhead, it would have detonated the incoming rocket the Army said.

Interception of an intercontinental ballistic missile traveling five or six hours in the air and which could possibly deploy decoys will pose a much more difficult situation for the Zeus. Next summer a Kwajalein-based Zeus will be launched against an Atlas ICBM launched over the Pacific Missile Range.

Nuclear Warhead

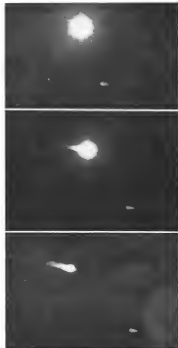
If the U.S. has authorized atomic power testing of nuclear weapons by that time, it is believed that the Nike Zeus will pose a nuclear warhead while tested against the Atlas. If testing has not been completed, non-nuclear explosives will be tested in the warhead.

Zeus measures 41 ft. in length and has a solid propellant booster which develops 470,000 lb. of thrust.

Scaling of the intercept at White Sands was made with electronic computer equipment. Simulations of the intercept and the miss distance were not required.

The Kwajalein installation will be used by the Army for the first development trials at Zeus, in which SCRM warheads will be intercepted.

System manager for Zeus is the Army Ordnance Missile Command, Redstone Arsenal, Ala. Prime contractor is Westinghouse Co., Santa Clara development under Ball Telephone Laboratories, Douglas Aircraft Co. builds the warhead and the solid propellant fuel is made by Thiokol Chemical Corp.



Nike Zeus intercepts Nike Hercules in the latter's ascent to earth. The Nike Zeus did not score a direct hit. Top photo shows glowing charge (large circle) ahead from Zeus to achieve direct point of intercept; lower photo shows subsequent light of Nike Hercules.

AIR TRANSPORT

Future of Warsaw Convention in Doubt

International air law system periled by fight over accident liability limits; U. S. may denounce treaty.

By L. L. Dyer

Washington—Fear in spreading through airline legal circles that the com-movers within the Kennedy Administration over whether the U. S. should denounce the Warsaw Convention (AW Dec. 25, p. 25) may result in the dissolution of the first major uniform system of international air law.

The Convention, drawn up at Warsaw, Poland, on Oct. 12, 1929, and ratified since by 60 nations including the Soviet Union, sets international standards for passenger liability, cargo liability and other travel documents. It also establishes liability limits for passengers' death or injury and damage to luggage and cargo.

New Congress opponents admit that their chief objection to the pact is to the liability clauses. They charge that the Convention imposes for the loss of life a higher rate than the average American passenger, that it is below standards of liability normally acceptable in U. S. courts.

Nearly all critics of the International Air Transport Act, both the House and the Senate, say all critics support the Hague Protocol of 1955, which, it is claimed by 30 nations, would amend the Convention to raise passenger liability limitations from \$5,750 to \$16,000.

Only 10 nations that have ratified the Protocol agree a number of routes have \$16,000 or less high U. S. airlines on the other hand, are freely behind the Hague Protocol, since it not only doubles the liability limit but retains the limitations of international law given out by the Convention.

President's Recommendation

The Kennedy Administration became interested because the President had announced to the Senate whether or not that body should ratify the Hague Protocol. Failure to ratify the Protocol would not abrogate the Convention, in which case the lower liability limits would be retained. Neither of the opposing groups in the U. S. wants that.

Consequently, the Administration is exploring the practicability of denouncing the Convention which would remove the liability ceiling entirely. Lawmakers have said that it is legal in the Convention and cannot itself force the liability limit.

The Administration's decision on denouncing the Warsaw Convention will be based in part on the recommendations to be submitted soon to the State

Department in the Interagency Group on International Aviation, which has been studying the issue. The State Department will have its own recommendations to make to the President.

U. S. Carrier View

U. S. airlines have been signing a supreme emergency group denunciation. They have complained that U. S. law only in the development of international agreements would be seriously undermined if the Convention were changed and that U. S. policy, in both economic and foreign policy, might be impaired.

They further state that, without the protection of the U. S. Convention, passengers and property at high risk of airlines' losses would become "catalysted in death and tape because of conflicting local laws, procedures and requirements on local in international damage, with lack of uniformity now denied by the Convention would multiply legal difficulties and direct expenses of reaching

a settlement in liability cases, they say.

A number of international centers cite these problems as typical of what a passenger would face if the Warsaw Convention ceased to exist.

A number of panel of negligence would slide from the center to the periphery. The Convention guarantees negligence in the center.

Foreigners would lose certain legal protection and jurisdictional advantage. Under the Convention, a passenger has a choice of four jurisdictions to bring his case: the carrier's corporate domicile; principal place of business; passenger's place of domicile; or the carrier's domicile or principal place of business.

Without the Convention, courts refuse to take jurisdiction and seek demands to a foreign court.

Lack of world-wide standardization of documents required by the Convention would force passengers to duplicate documents for each country.

Without standardization of contract terms of carriage in these documents, passengers could be forced to take action before a court in a foreign land that the financial protection in that country is lower than that afforded by the Warsaw Convention.

Convention opponents have argued that the present system of liability is "indefinitely morally, sociologically and economically." The core of the argument is that plaintiffs in an American court would be entitled to damages equal to the amounts awarded in foreign courts, not to an international average.

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generally emphasized the need for implementing legislation, or have more strongly insisted that it had already been passed, no early steps have been taken in the United States. As a result, American plaintiffs are being denied rights under the Warsaw Convention which plaintiffs in other countries have long since obtained.

Specifically, Sen. Sargent says that no ratification of the Warsaw Convention and American economic standards could be maintained by its signatories but that would require adequate consent in answer for the benefit of all passengers on international flights to and from the U. S. and would give the passenger no right to sue a statutory right of action against the insurer.

Unsuccessful Attempts

Sen. Sargent says that there have been several unsuccessful attempts to introduce automatic accident insurance by an international agreement. However, he points out that at least four airlines now provide such insurance to their passengers without charge. American, Air France and two privately-owned French airlines, TAI and UAT. He said that IATA would not support the free insurance plan on an industry-wide basis but to prevent price-cutting, the association has agreed a resolution opposing the advertising of free insurance by individual airlines.

As a result, the French carrier does not publish its accident rate, but the French and German charges its accident insurance plan into its "adjusted liability limit."

Sen. Sargent's remarks indicated that several airlines require automatic accident insurance by statute. These include Garuda, Air India, Air France and Air Algerie. In these countries provide insurance to passengers under law without additional charge. In Spain, travel insurance is automatic and is paid for by the firm, but not airline passengers. Iberia Airlines, however, absorbs this cost without an increase in fares.

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CAB Will Grant 3% Fare Increase

Washington—Civil Aeronautics Board late last week rejected all specific inflation fare increase proposals but indicated it would grant a general increase of 1% for a six-month period if this was requested. The CAB decision comes during the New Orleans Robert Kennedy and Martin Luther King Jr. funeral, who stated that any fare increase might adversely affect the industry's already reduced traffic growth rate.

The Board's decision also considered the industry's problem of low fuel costs and declines in coach traffic at first class (AW Dec. 4, p. 10), but emphasized that "no fare program alone can reduce earnings to sustainable levels. On the one hand, the industry's economic problems must be attacked on a broad front of which fuel costs improvements is the cornerstone."

The Board asked all carriers to submit to it by Jan. 15, 1962, suggestions for improving fuel factors.

Citing the current emphasis on low fuel costs from the Board said it was not convinced that coach services were "adequately" but profitable than first class. As an industry-wide study, CAB said, the industry could be permitted a general fare increase of not more than 1% over 1961 levels of economic distress. During that period, the Board emphasized, it would undertake a program to reduce the industry's fare economic problems. The Board also urged the carriers to ensure closely the safety of special fares and discounts now in effect with an eye to reducing them which are of doubtful economic value.

In particular, CAB said the industry should be permitted a 3% increase in first-class fares but that being offered at a price well below corresponding coach fares. As an indication to encourage more first-class travel, the Board suggested it would require an increase in first-class baggage allowance to 65 lb. and a new rule reflecting discounts at a sustainable charge in first-class service.

On other carriers, CAB said the industry should be permitted a 3% increase in first-class fares but that being offered at a price well below corresponding coach fares. As an indication to encourage more first-class travel, the Board suggested it would require an increase in first-class baggage allowance to 65 lb. and a new rule reflecting discounts at a sustainable charge in first-class service.

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Lower Fares Proposed for North Atlantic

By L. E. Duty

Washington—In a last-ditch drive to introduce new international fares on the North Atlantic before March, the International Air Transport Association (IATA) is circulating a draft resolution recommending a wide rate ceiling for regional air service and a revised individual maximum fare.

The group has said it will be 15% below the current, ready-to-use current rates for passenger traveling in groups of 25 persons or more. The individual ready-to-use maximum fare would be the same as the current 15% below the current rates, which expire Mar. 17, but would be effective throughout the year. In addition, the new fare would be applicable for a maximum of 16 days and a maximum of 21 days total.

Charters are again strong that the new low fare, which has been under consideration since the 1950 Caneau conference, will be approved by airlines operating in North Atlantic routes. Approval must be unanimous before the fare can be made effective.

Ticket date for the new fare is Feb. 1. Existing fares Jan. 5. Between Jan. 5 and Jan. 12, the fare, if approved by the contract, will be held with the government involved for formal approval.

Earlier Attempts Failed

A previous effort to set group fares only, introduced in late September (AW Oct. 2, p. 16), following regional traffic conferences in London and New York (AW Aug. 7, p. 5), failed because of widely split opinions on some issues. Although the vast majority of the airlines favored the group fares principle, struggling over regional conditions deflected both attempts.

In addition, British Overseas Airways Corp., backed by Air India International, firmly opposed the group rate principle at that time. SAS led a group of small carriers that wanted either a revised individual fare or more passenger benefits attached to the group fare. This difference helped seal the fate of the September rate vote.

At AN, which was originally expected to see one type of extension fare, but recently changed its position and now favors a lowering of rates (AW Dec. 16, p. 10). Despite split opinions, however, it was evident at the time conference that most carriers believed lower fares were vital to establishing increased traffic to the values on North Atlantic routes. As a result, the conference appeared to have agreed on a group fare, except to compensate the differences expressed at previous meetings and is concerned indicated in the September mail note.

The group consisted of representative from all air professional level from IATA, BACAL, KLM, Lufthansa, PAA, SAS Trans-Canada and TWA. Several which represented last month were held in Bermuda. All agreed that the recommendations to the group and extension fare which were dropped in the meeting would be the full report of the current fare represented. The draft document to the maximum rate posted in the mail note is the given one but future to agree one of the two best would remain.

The new group fare and the second extension fare would be effective throughout the year, except on weekends during May, June and July on outboard legs and during August, September and October on outboard legs. Passenger traveling in a group must travel together for the entire period.

The recommendation that a group fare would be a unit was one of the issues of controversy but it is believed that opponents, particularly Pan American, are now ready to accept this condition. Both differences in the minimum size of the group—25 and 10—were in 20 which was carried without 40-appeal to be revised in the election of 25 as a compromise.

One aspect of the group fare proposal which was most in dispute from the Civil Aeronautics Board is the determination of the eligibility of a group for the lower fares. For this purpose, the special working group has divided the eligible group into two categories: affinity groups and professional groups.

By IATA definition, an affinity group is an association, corporation, company or other legal entity which was formed for purposes other than travel and which itself has had sufficient authority prior to the application for transportation to distinguish it and set it apart from the general public.

A questionnaire to a group of professional groups has been publicly selected and gathered, directly or indirectly, by a person engaged in advertising or selling transportation services. The conference defines public selection to be a group of the public and the group (and plan) as "advertisements or on other writing or in some of public communications, whether paid or unpaid."

The new group fare, under the proposal, will be confined to the U.S., Canada and Mexico. However, group fares will not apply to and from Canada, U.S. and Mexico in the U.S. or Canadian provinces. Group fares cannot be used in the construction of several other world fares.

The revised conference has now has a better chance of winning approval, due primarily to declining load factors this year on North Atlantic routes. For most airlines, the group fare will be a traffic law to increase rather than that added benefits in the lower rate groups would draw business from higher fare classes, thus reducing gross aircraft.

Incentive Need Seen

In addition, carriers will continue to increase during 1962 to some 250 million passengers, an increase in air travel on international routes. Projects for a substantial increase in international travel during 1962 are considered good for world airlines, but are not expected to be successful without the backing of air incentives.

The majority of airlines agrees any further reduction in individual fares. The revised conference plan is expected to multiply outright proposals of reduced fares without losing the support of carriers that want the fare level to remain stable for another two years.

The rate for long-haul two fares is highly published during the past year that many airlines feel that failure to produce some form of reduction, such as the new extension fare, would bring a shiver of concern to the industry.

In the U.S., both fares will require CAB approval. The position of the traffic conference will be the fare with the Board if they are approved by the airlines.

SHORTLINES

► **Aviation Airlines** scheduled 12 extra flights Jan. 1 to accommodate a six-week rush of school travelers. The airline has scheduled 15 extra flights for Jan. 2 and on Jan. 3. The airline scheduled a total of 152 extra flights during the Christmas-New Year holidays.

► **Boeing Airways** reports tourist travel on all routes from the U.S. to Mexico has increased 60% in the last few years. In 1956, about 65,000 tourists from Mexico in 1960 the rate was 495,000. Boeing expects the increase to the addition of 1,000 hotel rooms in Mexico City during 1961 more than 12,000 additional seats being flown into Mexico starting with the introduction of jets and that will cost only half that of Europe.

► **Delta Air Lines** reports a net income of \$4.59 million, including \$509,000 on the sale of used aircraft for the last 11 months of 1961. Net income for the same period last year was \$5.99 million, which included \$119,000 in equipment sales. Operating income for the last 11 months was \$34.5 million, a 10% increase over the same period 1960.

► **Federal Aviation Agency** will hold a conference in Washington Feb. 27 to discuss airline equipment which will be required to implement the Project Boreas recommendations. Aircraft operators and air carrier equipment manufacturers are invited.

► **Flight Tiger Line** reports it moved 624,000 lb. of airfreight over the Dec. 16-17 weekend—the largest weekend shipment ever recorded in its domestic route.

► **Lake Central Airlines** has asked Civil Aeronautics Board to permit it to serve its routes on ready equipment, one-way service by truck. Truckloads will be used with CAB for delivery or as a means of service at U.S. airports, including, Lake Central, Chicago, Louisville, and Cleveland, Ky. and Nashville, Tenn.

► **North Central Airlines** reports a loaded its one millionth passenger in 1961 on Nov. 26.

► **Robert F. Sla, president** of Continental Airlines, predicts that the airline traffic will continue to grow through 1962. Sla, in a recent statement, can state that in 1962, Continental's one-way passengers will be up to 15 to 20% from 1961, while the industry's growth will be about 4 to 6%.

AIRLINE OBSERVER

► **Federal Aviation Agency** will be denying interlined parties access to important information despite the Project Boreas report recommendations. IATA follows the lead of other governmental agencies and keep its regulation proceedings open to the public. Comments filed in response to rulemaking proposals of FAA's Flight Standards Service may not be accepted until after docket is closed. The Flight Standards report urged that the practice be abolished immediately.

► **Number of passengers carried** by all scheduled airlines of the world in 1961, including the Soviet Union and the People's Republic of China, has been estimated by the International Civil Aviation Organization at 112 million, a 6% increase over the 1960 volume. The increase at the world level since 1946. Revenue passenger miles in 1961 were 73 billion compared with 67.5 billion in 1960. International Air Transport Association admitted that the 6% passenger increase fell short of the anticipated growth, but expected the belief that the volume increase will reach 5% next year. IATA Director General Sir William Hibbard predicted that the world's airlines will carry 821 million passengers in 1962.

► **Watch for the Federal Aviation Agency's Final 1961 budget** proposed to include a request for about \$30 additional in traffic controllers in order to accommodate faster land-side at selected ATC facilities. This request is expected to sever argument on whether the capacity of ATC centers and approach controls can be increased without by expanding their personnel components.

► **Market interest in airline equipment** is expected to rise, will need more talk has surfaced. Individual carriers or unions of carriers may spark some speculation but some airlines will wait until the industry is stabilized before starting any active buying.

► **Local service carriers** will likely record increases in passenger revenue miles for 1961. Load factor for the year is expected to be substantially higher than last year's level despite a heavy increase in available seat miles.

► **If new provisions against passengers** are adopted (AW Dec. 18, p. 41), airlines are claiming that the Civil Aeronautics Board is going to allow passengers to sue for damages to passengers who buy tickets and then discover there is no room for them.

► **An Franchiser** has informed its additional area franchisees that Continental Airline's transport for delivery in 1961. Completion of the order, supplied with delivery of the Boeing 707 international transports it has ordered, will bring Air France's passenger-based fleet up to 64 aircraft, 24 Boeing 707s and 40 Caravelles.

► **Aeroflot** will increase its Tu-114 trans-Siberian service from once weekly to five times weekly. The 170-passenger, double-deck, turbojet transports will operate from Moscow to Khabarovsk on Mondays, Tuesdays, Thursdays, Fridays and Saturdays. Weekday times are 6 to 10 hours.

► **Times** will establish a national flight system and is now formulating the system and how under which the company will operate.

► **Look for the local service carrier industry** to appeal to the Civil Aeronautics Board a nationwide network of low-cost carrier lines, similar to that adopted by Bonanza. The main purpose will be to provide tourist fares for foreign traffic under the "Wartime U.S.A." program.

► **Several airlines** using Washington National Airport are offering to pay higher landing fees that went into effect last October. Instead, they are continuing to pay the old rates and have cited the Federal Aviation Agency to discuss the matter for settlement. Airlines were faced with up to 20% to establish their position in permanent markets. Lowest their period FAA wants in three years, but it may be willing to compromise. Airlines are also willing to agree to an exclusive clause providing for gradual increases in landing fees.

Habily on Air

Washington—Federal Aviation Agency Administrator N. T. Halden offers to approve the date of airports and to state bills related costs (AW Sept. 6, p. 40) have been reported in the Airline Association (FAA) approved to the administration.

First test of the port, which is located in New Orleans, a local area and in the Louisiana Department of the Airline Association Airport affect the best in "transportation. American Airlines, Delta Airlines, Eastern Airlines, and Northwest Airlines, and the Airline Association. The Airline Association.

Halden said, "Whenever you try to get ready with using government you have a major task, an entire task of just doing it differently."



TOLLIER FLIGHTS form the backbone of Airia's operations. During the summer months, five Israeli domestic routes schedule 50-130 flights daily between Tel Aviv and Eilat. Photo shows DC-3 inbound from Eilat.

Israeli Domestic Line Maintains Profits

By Cecil Bowdler

Tel Aviv—Airia, Israel's small but no less domestic airline with only 338 no-deposit route miles to tell its tale, is keeping pace with its international counterpart, El Al, in the analysis of passengers carried, showing a profit and health lacking new equipment or replacements for its aging fleet of Douglas DC-3s.

With a total of 72 employees, 18 of them pilots, Airia linked Airlines Ltd., the carrier with 170,000 passengers into the Red Sea port of Eilat—a town of approximately 5,000 inhabitants—plus an other 12,000 in Hail and Rosh Pina in the north. In comparison, El Al's local Airlines in its Fleet 1950-63 year boarded 121,115 passengers.

The carrier, of course, in the trans-

it trade—an estimated 30-35% of all passenger traffic on a route basis. A major and growing attraction is the late shifters to place the carrier in the center of Biblical tourism within a short time and at low cost from Tel Aviv port of entry. To this movement of 1,100 a day, Airia works closely with a national bus company in offering package tours.

Excursion Flights

"One Day Package, Tour of Galilee," \$38-49 all inclusive, beginning with a flight to Rosh Pina, includes sightseeing, tape, bus along the mountain road to Nazareth, to Kfar Kana, where the Bible says Christ turned water into wine; Taberna, the capital of Galilee, the Sea of Galilee, and Magdala, the village of Mary Magdalene.

"Day Tour to the Red Sea," \$32, includes tour to King Solomon's Mines and Solomon's Pillars as well as a day diving among the tropical fish of the Red Sea and a visit to Eilat's Philip Maris House, a cultural center.

Longest regular scheduled route, Eilat—Tel Aviv—Eilat—167 round-trip, although special flights are sometimes made between Rosh Pina and Eilat, 217 miles. No frequencies vary with the season.

During the six-month summer period when tourist traffic is at its highest 10 to 13 flights a day are scheduled into Eilat from Airia's headquarters at Tel Aviv's Sde-Dov airport, and more can be added if there is sufficient demand. Over the remainder of the year, the round-trip flights during the mid-week are increased to a maximum of five and

are currently running at six per day. These daily round-trip Tel Aviv-Rosh Pina flights are scheduled on a year-round basis. These, too, are a morning and afternoon flight to the northern part of Eilat, primarily for delivery of daily newspapers with a national distribution on a contract basis, although passengers are carried in most of the runs.

Utilization Problems

Passenger load factor averages about 30% per flight, but effective utilization of the five DC-3s and single de Havilland Dove used the short stage lengths can be a problem. Present DC-3 utilization averages about four hours a day. The Dove is used primarily for charter flights and during the winter when passenger demand is low, as the newspaper route to Hail.

Toronto explains Low Airia included mailbags and second in command, "next to make it a day in, leaving in the evening and returning at night. So it makes it difficult to schedule flights during some periods of the day." Eilat and Rosh Pina residents, visiting Tel Aviv also prefer the morning and evening flights as a rule.

Airia's present schedule of six daily flights to Eilat Sunday through Thursday, depart at 6:10 a.m., 9:15, 9:45, noon, 12:15 and 5:10 p.m. Eilat take-offs are scheduled at 9 a.m., 11:10, 2:15, 3:10, 5 p.m. and 6:15.

On Friday, the schedule is trimmed to three flights a day. Eilat El Al, Airia operates all flight services over the Jewish Sabbath—Shabbat. Friday is Sunday for Airia—a factor that cuts sharply into its revenue potential. Straight on one day to Eilat is \$16-40, to Hail \$13-30 and to Rosh Pina \$18-30. Highest Airia fare within Israel, except for the package tour costs, is the \$25.75 round-trip between Rosh Pina and Eilat.

In order to boost DC-3 capacity to a maximum of 37 passengers each, a number of modifications have been made to Airia specifications. Light weight, low-maintenance high-pressure aluminum alloy fuselage, 21 ft. each with seat belt have been substituted for the 36-40 seats that were originally aboard the aircraft. A light sandwich-type flooring covered with a glass fiber flock has replaced the previous metal underfloor and carpet toping. Some of the original soundproofing also has been removed from the fuselage.

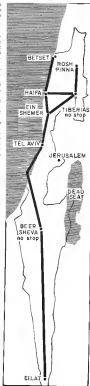
Total weight saving per aircraft is 880 lb., equivalent to four passengers with baggage, free weight.

Airia hopes to replace two or three of the DC-3s which were originally purchased by the Israeli government during the 1947-48 war of independence with two-engine turbo-prop equipment within the next 18 months. Civil Pilot 11-1 again, a former aircraft of South Africa and Israeli air force, has visited a number of European manufacturers within the past few months, and the airline currently seems to favor the Fokker F-27 Friendship.

Helicopter Tested

It also has experimented with helicopter tourism in the port-operating a Sea Hawk 2 for a year and a half—and began again last year, with its isolated historical sites plus a need for cargo and passenger flights into rural areas at a price just for such service when a helicopter with high lift capability and sufficiently low seat mile cost becomes available.

The four-passenger Aerospatiale, however, was taken out of service and sold as a hold in a money-tight operation. Its name before, besides the fact that helicopters generally are very expensive, was that it was too light to give service at a cruise on cargo missions, second



AIRIA DC-3s average four hours daily use. Four of the carrier's total of five DC-3s are shown at Tel Aviv's Lod airport before move to Sde-Dov. Airia also operates one de Havilland Dove, primarily for charter flights.



SEA HAWKETTE helicopter, formerly used by Airia, is shown at isolated coastal site south of Beer Sheva. Carrier's water map is at right.

ing to Digos. "For the general tourist," he adds, "the rate starts out also was too high."

Cost of an Alacarte charter was \$120 per flight hour or \$10 a passenger when light. What Alacarte needs, Rigns says, is a 500-ft² passenger vehicle with one movable, continuously curving wing, length.

Internally, Alacarte also hopes to eventually begin scheduled service into the divided city of Jerusalem: the capital of Israel and the country's spiritual, though, toward attachment. The Israeli bank airport has across the line in Jerusalem division, however, and the French portion of the city is now set to be a scheduled base only. In another triumph.

The closeness of Israeli Arab borders—the bulk of Jordan can be seen from Tel Aviv on almost any flight, but this is particularly true in Eilat when the car ride between Eilat and Jordan is only a few miles wide. In addition, the Eilat field is at 4,500 ft. north-south runway is limited only 14 miles from the Jerusalem airport for the same set of problems, and there is no fiscal compensation or traffic considerations to reduce the two routes. Yet, there have been no real problems there for the 12 years Alacarte has been flying into Eilat.

"We don't talk to one another,"

Chief Pilot Agnes says, "but we listen."

On the approach flights, Alacarte flies over the Gulf of Eilat, then over the water to the line between Jordan and Israel. Jordan and Israel come in for a no-fee landing. The same procedure is followed on arrivals to the north.

Alacarte began in 1949 primarily as a cargo carrier, flying C-46 loads of drinking water, fuel, mail, vegetables and other necessities to Eilat which was then isolated from the remainder of Israel. The Eilat cargo flights continued as a major source of income until 1955 when a major road to the port was opened, and subsequent trucks took over the job.

Tourism Profitable

With the loss of the cargo route, Alacarte dropped out of the red in 1954 after a peak year in 1957 but managed to pull out into the black again in 1959 with renewed emphasis upon passenger service. It has remained there since and with the growing tourism into Israel, expects to again in 1957 from its next year.

Alacarte ownership is divided on a 50-50 basis between the government and Israelair, the national airline operator. But there is no subsidy coming from either source and to survive the

little Alacarte must stand on its own.

Cargo flights to all points are playing a declining role in the carrier's overall business, although there is still some activity in occasional charter business. "We'll be smaller," Agnes says. Nevoon, Cyprian, flights over 200 mi. now, has been a more charter point for both cargo and passenger flights, and the airline last year logged over 1,000 for an express operation.

While passenger operations have, as expected, been appreciably more profitable, although there is still some activity in the express business in the past, Alacarte has taken on much charter as regular twice-weekly flights to Sofia and Rome with the aircraft loaded with Israeli civilians for European transportation.

The passenger charter flights have over the year been operated on a pool basis with El Al.

Alacarte is an operating company in the Israeli state. All maintenance and overhaul is contracted to Israel Aircraft Industries Ltd., which keeps an average of seven engines, including one spare, at Tel Aviv for the use of the two fleets. A day operated by Alacarte, the including operations are handled by a private firm.

"We are in Sperry here as you can get," says Alacarte's Agnes. "The way we live, the way we live. That's how we stay in the black."

Mohawk to Continue Gas Light Flights

By James D. Hendricks

Union, N. Y.—President of Mohawk Airlines Gas Light Service among other aviation business has found the multi-engine local service to continue the flights between the set of old airports with act for the first of the year.

This Sunday evening Douglas DC-3 service between Victorian-style houses

and hotels, bars and nightclubs. It was started in September, 1940, as a "gas light" to local airport to Mohawk's flying DC-3s to land the airline could build up its fleet of Cessna 310s and 440s and Mustangs.

Gas Light has proved so successful, however, that it has posed a unique problem to the carrier's management in trying to abandon it.

As a result, Mohawk has decided to maintain the service on a reduced schedule basis, and still more profitable to maintain its popularity, and provide it for charter operations.

New Schedule

Mohawk's new schedule, which went into effect Dec. 15, includes three Gas Light flights a day from Buffalo to Albany with stops at Rochester and Seneca, 5:30 p.m. from Albany to Buffalo with Seneca and Rochester stops, and 5:30 p.m. non-stop Buffalo to Albany.

Previously, all Gas Light flights started after 5 p.m.

The 1 p.m. flight formerly left at 4 p.m., but has been replaced at that time by a Cessna because traffic demands were too heavy for the DC-3's 25-gp. weight capacity.

Mohawk notes these structure and developments in partial proof of success that has been achieved with Gas Light Service.

- Consistent 120 to 150% average load factor on Gas Light flights since their inception 15 months ago.
- No scheduled local, national and inter-national situation required by the service.
- Several companies share Gas Light as



PASSENGER CARRY is styled after a Victorian parlor, with velvet curtains, carpet and iron posts and electric lamps fashioned like gas lights.



GAS LIGHT DC-3 features distinctive louvered awnings, use of old-style paint for the name and gas lamp insignia on the tail.

carefully scheduled in extra service for scheduled flights with newer Mohawk planes, was failed to capture while the primary service was left with several empty seats.

"Because of our attitude," says, "we have been able to attract a large section of people interested in the Gas Light Service as the most familiar aspect of the airline's operations."

We created a member-but a good use for it," Mohawk's Agnes says. "Gas Light has paid for itself on occasion, and more than paid for itself in public."

Peak Period

At its peak period in late 1948 and early 1949, Gas Light served Boston, Hartford, Albany, Utica, Syracuse, Rochester and Buffalo via Montreal through Friday flights out to west and Newark to Waterbury, N. Y., and the Thousand Islands area on north-south flights. Until a few months ago, the flights were limited to one only, but Mohawk and it has had to move that restriction under pressure from summer passengers.

"We thought the best and right course would be to use what we have," Russell V. Stephenson, Mohawk vice president and service man. "But as long as they want to get on board so, it is for them."

Stephenson estimates most of Gas Light's passengers to the "old-fashioned DC-3." "Let's face it, the DC-3 is at least obsolete," he said, "but the board and open door to write up for that."

At present, Mohawk has three DC-3s in operation, including the two operated by Gas Light Service. One standard plane is used as a standby aircraft for charters and scheduled legs between Binghamton and Poughkeepsie, a regular flight route by International Business Machines Corp. employees traveling to IBM facilities in the area. Another Mohawk DC-3 is for sale at the airline's facility in Albany.

Gas Light planes are identified by a special red and black livery with the name in old-style paint and a gas lamp insignia on the tail. Inside, they are styled after a Victorian parlor, with padded velvet upholstery, big leather chairs, carpet and iron posts on the walls, and velvet curtains with gold fringe electric lamps louvered after gas light on either side of the door and a padded chair pointed in their down-curved shape on the rear wall of the cabin entrance.

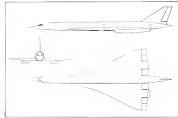
The standard was a replica of an 1890 vintage full-length gown with of low-length skirt and a plumed hat. During the flight, the carrier hostesses, petticoats and capes to the passengers.

Gas Light planes without the special service have been available at no additional charge, for charter bookings since last August. Flights with the service cost an extra \$50 charge and have not

been particularly successful. "Many clubs and social groups going to football games or conventions are about the only ones who request Gas Light Service for charters," Stephenson said. "We're planning to use the service experience with the flights to step up its appeal for charters."

Mohawk also plans to continue using Gas Light planes as extra service to back up its Cessna and Mustang. "We wouldn't mind an occasional DC-3 into an airport like Buffalo, for instance, to report beside someone else's job or election," Stephenson said. "But we would have no problem about sending a Gas Light DC-1 because it's an attractive plane."

Stephenson said Mohawk is not planning to convert Mustangs to Cessnas in Gas Light line service. "It's just a hunch, but I don't think the decision to convert would do as well as our own planes at it has on the DC-3."



Super Caravelle Configuration Detailed

Full Interior Super Caravelle Mach 2 transport with four double-aisle seats under folding deck (1940 Dec. 4, p. 45). Engine would be four Pratt & Whitney turbines (2,000 hp) (shown) with partial streamlining and thrust reversers.

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NUCLEAR ATTACK AND INDUSTRIAL SURVIVAL

The Editors of McGraw-Hill consider this report the most critical assignment ever undertaken by our segment of the business press of this nation. In its development, at one moment or another, each member of the task force has felt the nervousness, contemplative weight of the subject and the almost overwhelming demands for accuracy. Rarely have we dealt with a matter of such potential impact to risk to death and to impossible leaders in all segments of the American economy. Now, before we have we volunteered as much effort, hoping it would not be needed.

However, not only now during the Berlin crisis, but probably for many years to come, the U.S. will live under threat of a nuclear attack. How will we could survive such aggression, and how rapidly we could recover a viable civilization, depends heavily on how we prepare to meet the danger.

And yet, paradoxically, we are aware that the very effort to do this work . . . or even to address this subject . . . is controversial. There are those, in highly respected circles of our society, who say we need defense is worthless . . . that the most security you feel, the more willing you are to risk the likelihood.

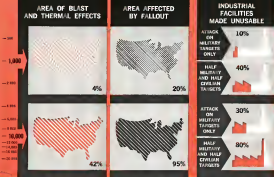
• Our study of nuclear attack, and consultations with experts both within government and outside, convince us that responsible and prudent management can, and should, act on the basis that protective measures must include a sound form of conscience.

• We believe the suggestion that a sense of security might preclude aggression holds both the intelligence and the morals of the American people. Nothing in this report, or in any other making, approval of the nuclear subject, no-nuclear aggression or blockade, the the contrary, the peaceful discussion of destruction . . . despite all preparations for protection . . . would the nation effort for protection of nuclear war.

This report concentrates on the problems of U.S. industrial survival for two important reasons. First, the conflict, opposition that industry already has can be a powerful force for the protection of people. Second, in the aftermath of any war, it is vital to society that production be restored as quickly as possible. Therefore, in planning for both survival and recovery, business and industry have special responsibilities . . . to employees, to the community, and to the nation.

Let us make one thing absolutely clear. If any part of the pages that follow can be read as an attack on our readers, then we have failed our job. The Editors of McGraw-Hill do not believe that nuclear war is likely, but we do believe that the possibility of a . . . however remote . . . must be examined.

The Editors of McGraw-Hill

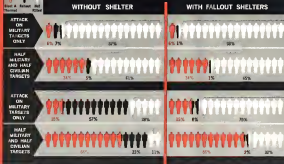


ESTIMATED EFFECTS OF NUCLEAR ATTACKS at a clearly credible present level (10 megatons) and a possible future one (100,000 megatons) are shown to be 10 and 100,000 square miles and 4% and 42% of the U.S. land area, respectively. The 100,000 megaton attack would destroy 42% of the U.S. land area, including 42% of the U.S. population.

Effects are shown at 100 megatons level. The automatically included all-terrain coverage area in total effect area, principally, would be limited to 100,000 square miles or 10% of the U.S. land area (100,000 sq. mi.) in combined military and city attack. Military targets would be destroyed in 10% of the U.S. land area and city targets in 10% of the U.S. land area.



FATALITIES AS % OF TOTAL POPULATION



Attacks on military targets (100 megatons) would destroy 42% of the U.S. land area, including 42% of the U.S. population. The 100,000 megaton attack would destroy 42% of the U.S. land area, including 42% of the U.S. population. The 100,000 megaton attack would destroy 42% of the U.S. land area, including 42% of the U.S. population.

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THE DIMENSIONS OF DISASTER:

What might nuclear attacks cost us in facilities, people?

Because no nation has ever suffered a full-scale attack employing modern thermonuclear weapons, there is no direct experience to use as a basis for appraising the damage the U.S. would suffer under such an attack—or for gauging what government, industry, and others in the community might do to provide protection.

To assess the damage in advance, you must turn to data drawn from postwar studies of the relatively small attacks on Hiroshima and Nagasaki, and from the tests conducted in the years since.

These give reasonably precise knowledge of the effects of a single explosion. And they make it possible, with only slightly less precision, to calculate the effects of a known pattern of bursts.

Attack estimates. To estimate the results of large attacks, however, you must assume a range of factors. Total size of attack, size of individual weapons, type of burst, and—most controversial of all—the nature of the targets. In other words, you must try to divine the enemy's strategy. Any estimates you produce reflect the assumptions with which you begin.

In the chart below, you see an attempt to picture the range of possible attack—from a level that is credible now

to one that might be credible in the future. It also shows the effects of some of the variables. For example, in this case the assumption is made that 10 megaton weapons would be used. Of course, it is possible that no enemy might employ bursts both larger and smaller than 10 mt, with somewhat different results.

Another important variable is the burst pattern. Surface bursts do the most blast damage to man-made sites and facilities, hence might be chosen for military targets. They also yield radioactive fallout that can kill people and disrupt life many miles from the target. On the other hand, air bursts inflict blast and fire damage on two to three times more area. These might well be used against "soft" military targets and centers of population.

Target selection. Biggest variable of all is the enemy's selection of targets. The chart shows two patterns for each level of attack, one concentrated on military targets, the other divided equally between military targets and cities. In both cases, half the bursts are in the size, and half are on the surface.

The smaller attack, directed partly at cities, could actually cause more deaths and damage to industrial facilities than would the larger attack aimed solely at military tar-

gets, because industrial facilities tend to be concentrated in or near centers of population. These figures point up the crucial role targeting would play.

The chart at right above shows what might be accomplished by a truly good protective program—a goal that could be reached only by a major change in the nation's present unprepared posture. It should be noted that the chart assumes a one-day war; losses would be different—and probably greater—if a big attack were followed by several smaller ones.

Important as such estimates must be, what can they teach us? How should we interpret them?

Clearly, these figures—and those of other authorities—show the sheer size of the problems posed by nuclear attack. Right now, a single blow could cost us 40% of our industrial facilities and, without protective measures, 30% of our population.

Destruction varies. In assessing the gross picture, it is important to realize that destruction would not be universal. Nor would it be uniformly distributed. Some areas would be essentially unaffected. Others, many targets, would be physically annihilated but contaminated by fallout. Closer in, there would be areas with even greater fallout coverage, plus fire damage. Moving in still closer, blast damage would be heavy, and fire and fallout would make conditions still worse. Finally, there would be centers of virtually complete destruction.

It should be clear that no emergency management can predict which of these varying degrees of destruction might hit its facilities. It is equally clear, however, that there

would be many areas in which protective measures, such as shelters, would be effective, as the casualty figures demonstrate. And the "graded" nature of the damage allows some clues to the appropriate management might take in planning for survival approaches that will be examined in more detail later in this report.

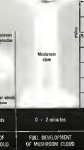
Finally, this effort to gauge the dimensions of the disaster resulting from a large-scale nuclear attack gives some idea of the environment in which individuals and companies must try to rebuild. There would be an "insurance as usual," even in the relatively unaffected areas of an economy that has suffered major disruptions to the services on which industry depends—communication, transportation, utilities, and materials, fuel, food, money and credit, to name some. This glimpse of the post-attack period gives urgency to efforts to plan now for the problems of the recovery.

In the following pages, this report tells business and industrial management what it needs to know about:

- The effects of nuclear attack—fire, blast, fallout pages 4-6
- Plans to make in advance for surviving an attack pages 9-13
- Preparations that can be made for post-attack recovery pages 14-16

Reason products
by design/quality

12



Mach. 10-11 Spines and rays reduced. Rising half of fin on bony lamina, extends along spine and 1/2 way into anal fin area and down high posterior back ridge. Skin low reflexible sheet.

What are the immediate effects?

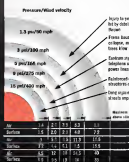
Sequence of events in a nuclear explosion appears in Fig. 1, above. First there's a flash of light that can be seen

ably, blinding - eyes turned directly toward a soldier inflicting harm, even at distances of hundreds of miles with megawatt blasts. How much damage is done to the eye depends on such factors as weapon size, height of burst, time of day.

- velocity, and speed of blast action.
- Halfway of a second after the bomb is detonated, the fireball forms and grows by engulfing surrounding air; about two seconds it reaches a maximum diameter of 14 m for a fragmentation (f) bomb. Maximum diameter is 3.4 m for 10 m, 4.6 m for 20 m. When the bomb is less, and the fireball touches near, all above-ground installations within it are vaporized or otherwise destroyed except for heavy concrete structures.
- Simultaneously, the explosion releases an initial burst of radiation - about 5% of the bomb's total energy - that

BLAS

→ travel's faster
than sound
(over 770 mph)



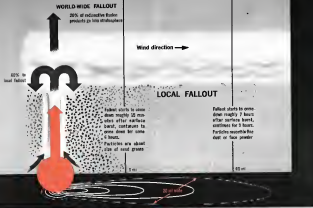
3. About 20% of healthy nasal sinuses grow into what the brain of the blind, called the "blind brain", breathes rapidly away from the forehead, behaving like a moping wall of compressed air. Since there are about 100 million cells of blood pressure equivalent and cells, and possibly others in the arterial tissue between successive circles

loss the thermal flash; about 50% of weapon energy is in this form. The blast wave starts as a high-pressure shock front, traveling somewhat faster than the speed of sound. After a few seconds, a negative pressure phase follows. The effect is to first squeeze and then expand or explode structures and human tissue.

Along with these great swells in pressure, there would be short wind gusts of enormous velocities — up to 1800 mph near ground zero. Dying forests of these winds would inflict much of the damage to buildings and the bulk of blast injuries to humans. As Fig. 3 shows, shock pressures in themselves would be fatal over only a small area by comparison with the area in which pressures and winds would hurt people and objects through the air to cause injury and death.

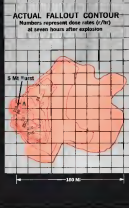
Near ground zero, pressures and winds are higher in a surface burst than in an air burst. Further out, an air burst creates stronger pressures and winds because the blast wave bounces off the earth and reinforces the primary wave to create the so-called "Mach front" (Fig. 1).

Thanks to the relatively slow speed of the blast wave, there is often time to take evasive action, such as dropping flat, or seeking shelter below ground.

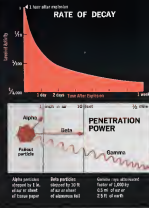


4. In contrast to air bursts (Fig. 1, page 6), where fallout goes mainly to the atmosphere and may thus be characterized by heavy local fallout, this results from about 20% of debris being up into the blast. Like the majority of the bomb such debris is initially suspended. Material swept up later may be

only raised. When the vaporous materials, including fission products and radioactive waste, including fission products, condense into fine particles many of them adhere to larger debris particles. Resulting size heaviest particles from rising gas causes them to settle out over large areas as the radioactive cloud moves with the wind



5. Theoretical pattern of fallout accumulation at ground level is shown in terms of diagram on facing page. In contrast to this diagram, actual distribution may be highly irregular, as is indicated above. Note particularly the several local "hot spots" and the fact that radiation intensities do not always fall off smoothly



6. Radiation from fallout particles decays rapidly as the isotopes, as shown in upper curve. The radiation later from some alpha and beta radiations consist of alpha particles that do not travel far, can be stopped easily. Gamma radiations are less easy to stop. They can travel relatively far and they have great penetrating power

NUCLEAR EXPLOSIONS: How fallout hazards develop

A nuclear explosion creates about 90% of its total energy immediately — in initial radiation, heat, and blast. The other 10% shows up afterward, mainly as radiation from fission products that rise with the mushroom cloud. Since, or later, they descend to earth as fallout.

Fallout has its origin in the fission chain reaction that triggers the nuclear blast. This forces more than 200 different radioactive isotopes, which begin at once to decay, each at its own rate. Some decay almost completely as a matter of minutes, others as slowly that years later they are only slightly less radioactive. The differences in decay rate are a crucial factor in determining the hazards of fallout, and also in distinguishing between the two types of fallout — global and local.

Global fallout is the type that has resulted from weapons tests already conducted, most of them air bursts (Fig. 1, p. 4). Fission products formed by such a burst first vaporize, then condense as extremely fine particles that rise into the stratosphere and travel with upper-level winds for long periods of time. Meanwhile, decay eliminates all but the long-lived isotopes, such as the much-dreaded strontium-90. When the particles do drift down to earth,

they are widely distributed. So they raise the radiation level at any given point only minutely.

Both increases in radiation levels are considered to produce genetic effects. And strontium-90, moving from the earth's surface to plants and to food, may be selectively absorbed by the human body to cause bone cancer. Because these are all long-range effects, the impact of global fallout from nuclear tests is widely debated and will be truly known only in the future, when sufficient statistical data have been accumulated and analyzed.

Local fallout is much quicker to take effect — and much more dangerous. This type of fallout results from surface bursts, which would probably be part of a nuclear attack. Fission products from the explosion agglomerate with larger particles of debris (Fig. 4, above) and roughly 80% of them settle to earth in a matter of hours. Heavier particles descend in the first hour or so; lighter ones take several hours or more and winds carry them over hundreds of square miles. The major and immediate danger of this local fallout is radiation from these particles as they sink down over land and buildings.

The other 20% of the fission products from a surface

burst go into the atmosphere and become global, or world-wide, fallout. Because fission products are created in direct proportion to the amount of material exploded, a nuclear attack involving thousands of megatons would produce much more global fallout than has resulted from all the weapons tests to far.

Theoretical calculations to determine the distribution of local fallout usually assume that the wind blows in just one direction at 15 mph. Under such conditions, radioactive fallout will tend to settle in a cigar-shaped prism (Fig. 4, below), with radiation intensity diminishing in the down-wind direction and toward the outside edges.

In practice, however, winds at different altitudes move in different directions at different speeds. So actual patterns of fallout tend to be highly irregular (Fig. 5). This means that it isn't safe to use reports of general radiation levels as an estimate of hazards in your area. The only sure answer is to measure radiation locally.

How to measure. Fallout particles emit three kinds of radiation (Fig. 6), but only one — gamma radiation — is of major importance. Gamma radiation is like X rays and you can't see it, or feel it, or taste it, or smell it — recognize. To measure the dose rate or radiation intensity, you use Geiger counters (Fig. 7), or the dose, in the worst units — roentgens. To measure the dose rate or radiation intensity, you use Geiger counters (Fig. 7), or the dose, in the worst units — roentgens.

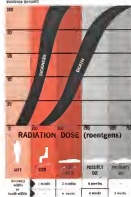
An instrument called a dosimeter will show the radiation dose to which you have been exposed. One common type,

designed to be worn, is shaped like a fountain pen. Dosemeters of this sort usually record accumulated radiation up to about 600 r. In addition to keeping track of the total dose you have accumulated, you should also know the rate at which radiation is being received (r/hr). This can be crudely done with a dosimeter, by noting the increase in total dose over a period of time. For greater convenience and accuracy, a similar pen-and-pencil device is calibrated to read the rate up to 100 r/hr.

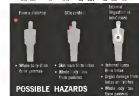
More elaborate portable instruments are on the market to measure radiation intensities up to 500 r/hr — although at such high levels hands containing radiation are dangerous. For most safety, you can install a stationary instrument — capable of registering levels of 1000 r/hr or more — and hook it up for reading in a protected location, such as a group shelter. To use the more elaborate instruments properly, operators would need a few hours of special training.

Speeds of decay. In appearance, fallout particles have a glassy surface. They range in color from white to black, and in size from clearly visible "sand" to barely visible powder (several thousand microns down to about 20).

In any group of fallout particles, there will be a wide variety of isotopes, each with a different decay rate. For mixed fission products, the radiation level starts high but drops quickly (Fig. 7), as the isotopes with rapid decay rates spend themselves. An easy rule of thumb is that for



6. Effects of whole-body radiation doses can only be expressed differently. Doses show percentage increases of human and death for a group of exposed persons, for doses accumulated by a few. Dose effects are less severe at nonuniform dose levels or periods. As indicated at bottom, radiation effects are usually a dose rate problem.



7. Radioactive fallout particles (shown diagram) can cause more than a distance dose. Direct contact, or internal ingestion, shows more than a distance dose. Direct contact, or internal ingestion, shows more than a distance dose. Direct contact, or internal ingestion, shows more than a distance dose.

each increase is time by a factor of seven, the radiation level decreases by a factor of ten. Seven hours after a burst, radiation level will be 1/10 of the level in the first hour.

In practice, however, it's not quite so simple. The first fallout might not arrive for 15 minutes or more after the explosion. But then fallout might keep coming for a year, and mean that offset the decay that was occurring. As fallout started off, however, there would begin to push radiation levels down, and after all fallout had arrived, the "level of seven" would apply with reasonable accuracy for several months. As the rate of change in radiation would look like the humped curve in Fig. 7, but the dose accumulated by an exposed person would continue to increase, although more slowly after fallout has stopped coming down and the peak of the rate curve has been passed.

Radiation hazards stem from the fallout particles themselves. The air through which fallout passes, and the surfaces on which it settles, do not themselves become radioactive. However, the particles and their decay products, alpha and beta emitters from fallout particles penetrate such a short range that they are dangerous only if you cannot avoid inhaling, ingesting, or coming into skin contact with them. Gamma radiation is more perilous, however. It can be effective a considerable distance from the particle and has great penetrating power, hence ranks as a major hazard. An hour after a burst, the accumulated fall-

out on a 3000-ft line—measuring at most 1/100 inch deep—might subject a person standing in the center to a dose rate as high as 3000 r/hr.

Effects of radiation on humans depend on such factors as age and general health. But statistical projections (Fig. 8) show that some people would not survive a dose of 300 r received over, say, 24 hours, while a few others would recover from twice this dose. Recent studies suggest that it is possible to survive even greater total doses accumulated as small acute over long periods of time.

Radiation causes sickness generally by damaging the blood-forming organs in the bone marrow and lymph glands. In early stages it is usually accompanied by nausea, diarrhea, general weakness. These symptoms usually appear during the first day. Loss of hair, and skin ulcers, may follow in more severe cases. There is no specific treatment, but antibiotics and blood transfusion may help. Recovery is slow, involving weeks or months (Fig. 9). The sickness is not necessarily lethal.

For more details, consult "Effects of Nuclear Weapons" (OECS and "Cooperative Nuclear Effects of Bombardment" (OECS/64) (11), both published by the Atomic Energy Commission and for sale by Superintendent of Documents, Washington, D.C.

There is also a wealth of information in the report of hearings conducted by the Joint Committee on Atomic Energy (June 1959) and the Committee on Government Operations (August 1960).

SURVIVAL AND RECOVERY:

Why industry needs to plan now; how to go about it

What can business and industry do to prepare for the possibility of nuclear attack?

If your office or plant suffers a direct hit, obviously the answer is no. But the likelihood is that, even in a massive attack, the degree of destruction would vary (pages 2 and 3). So you would have some chance to survive and to recover.

What plans should you make? As an executive, you are responsible for seeing that your company continues to exist and to function. In the near recent times, this responsibility is directly to the stockholders—the owners. More broadly, you have a responsibility to your employees, their families, the community, and the nation. Your company's reputation and resources could be vital in coping with the crisis an attack would bring; the services it performs could be equally essential.

In the ordinary course of business, you plan some form of insurance to protect your company against a variety of risks—fire, earthquakes, and so on. A large-scale nuclear attack is a risk that has never become reality. But it differs only in magnitude from the risks you routinely take into account. It is overwhelmingly only slightly to say that you can apply the principles you use in preparing for other risks.

Seeking a balance. In building a conventional insurance program, you would try to assess the risk as realistically as possible—the degree of damage that might be inflicted, how likely you are to suffer such degrees of damage, how much it would cost to buy different amounts of protection. From these calculations, you would then take some sort of balance, to give you the most protection possible for the money you can spend.

How would this approach apply, for example, to protecting your company's personnel from the effects of a nuclear attack?

You can't do much to protect against a direct hit, of course. But with nuclear attack, as with other risks, you don't assume that total loss is certain. The best estimates suggest that the most widespread danger will be from fallout. Second in order of probability comes fire, left in the combination of fire and heavy blast damage.

You must consider costs as well as probabilities. In general, the lower you might be to the target, the more it would cost to provide physical protection. Estimating these two factors, it seems relatively easy to justify steps for protection against fallout.

For a minimum investment, you can achieve some measure of protection against the most likely hazard.

But don't stop there. For comparatively little more money, you may be able to buy some degree of protection against fire and blast. It depends on your situation, of course, to find the most practical answer, you must weigh the increasing costs of greater protection against the decreasing scale of damage probabilities.

Plans such as this for protecting personnel are only part of the overall thinking that should go into the effort to reverse a nuclear attack—and recover. Ideally, you should consider every element of your company's operations—such matters as preserving the framework of organization, its assets of all kinds and the records that prove ownership, its productive knowledge. And, when new facilities are planned, you should consider the positions of survival under nuclear attack in their location and design.

Guidelines. To draw up an effective plan, you might think broadly along these lines:

- The plan should start with top management—and top management should give it continuing support. This means handling the preparation with a meeting of directors or key officers, assigning the planning job to responsible people, informing employees of the policy over the chief executive's signature.
- The plan should be firm. In other words, it should not slide and flow with the tides of international tension, or some past planning far days.
- At the same time, the plan should be frequently reviewed to keep it in tune with changing conditions. New weapons, for example, might make your previous preparations obsolete.
- The plan should suit the community. You should coordinate it with plans of local government and neighboring industries. You should also consider what to do about employees' families and nearby residents. But, in most cases, you probably shouldn't count on civil defense authorities to solve all your problems for you.
- The plan should be suited to your company—its own resources, priorities, type of operations. Some companies have found that streamlined procedures devised for the emergency plan can be applied to make everyday operations more efficient.

Thus, in broad outline, are some of the goals to aim for in preparing a plan for your company. More details as how to plan follow.

In its day-to-day operation, your company depends on all sorts of links with the rest of the economy. It uses the services of the three perimeters, communications, utility, and banking systems. It relies directly or indirectly on outside sources for materials, fuel, food, and other supplies. It likely is the community to provide such assistance as water, sewage disposal, law enforcement, and other public works, health services, and the like.

Nuclear attack would tear this fabric and leave behind a patchwork of areas with varying degrees of damage (pages 2 and 3). For your planning, you must to visualize how this would be done, and what steps are under way to reduce the damage and to restore services after an attack. It is impossible to predict post-attack conditions precisely, at courts, and may present plans are tentative and subject to change. But here is a partial summary of the probable situation in vital areas.

TRANSPORTATION—For moving food, fuel, medical supplies, personnel, and personnel to be the service perhaps most essential to recovery. Business with their fixed routes are likely to be hardest hit. With adequate

fuel supplies, trucks and other flexible forms of transport—such as aircraft—could operate by bypassing damaged areas.

Infrequently planning or looking to be disrupted by disaster, perhaps the federal agency would have emergency control over carriers, whether over the streets and highways on which they move. And that control seems to apply only to interstate carriers. There is no authority to coordinate interstate trucks and private company fleets.

Present plans call for carriers to take their steps in emergency: (1) Warned of all goods, and probability of possible (2) Down period to limit at least one, perhaps three operations to start having priority traffic.

The industry has begun to form trucking organizations groups that may become the core of a federal emergency transport system.

COMMUNICATIONS has several vulnerable points—among them, the network of control lines and the lack of protection for radio and TV personnel and equipment to maintain high altitude explosive of large nuclear weapons could cause temporary radio blackouts.

Major emergency centers are working to

"harder" lines and equipment and to expand key target areas with self-contained under ground communications stations. They also have repair crews, fully equipped and trained for disaster, with ready disaster plans. Some radio and TV stations have lowered job before weapons. And there are plans for radio disaster command and amateur radio operators.

During the early period of recovery, emergency communications would probably be available only for highest priority messages.

UTILITIES are in danger because many power generating plants are concentrated geographically and because communications lines are so exposed. Suggested measures include building multiple and interconnected lines, and dispersing networks. Many companies are studying ways to protect personnel and equipment, and constructing alternate emergency control facilities.

Utilities have a major role in personnel and equipment in dealing with disaster. **INDUSTRIAL AND COMMERCE** is one area where plans are ready now. The Federal Reserve System has led other government agencies in preparing for the problems of recovery if that state

lines of government and military circles. Member banks have been encouraged to take steps to reduce the risk of failure. Reserve funds have been placed in safe locations from which they could quickly be released. Reserve funds have been placed in safe locations from which they could quickly be released. Reserve funds have been placed in safe locations from which they could quickly be released.

A check with the fuel and its member banks may greatly simplify your own plans for emergency supply for money and credit.

LABORERS find it not likely to be a critical problem early in the recovery except for short shortages caused by transportation strikes. The plan probably more food would remain in place.

General plans have been in place at all emergency bases and packages that remain closed. No more closed would be useful, except in heavily damaged areas. Some of the standing costs that would be increased and some other disaster compensation. Livestock killed by nuclear would be sold if properly dressed and refrigerated.

From that contact (includes) and (includes) would probably be sufficient to restore the economy while they slowly restored state

level-of-consumption (includes) to (includes) **PUBLIC WORKS** would present a variety of problems. According to most reports, water supply would not be a serious worry. Surface water, and even reservoirs would be contaminated by fallout, but most of that could be filtered out. Some believe would be viable, however, and this might require early action to adequately to keep enough for sale use, or limitation of no-exchange treatment in so-called to avoid treatment for pollution.

Water distribution systems, sewage and stormwater would require various degrees of damage. Sewerage plants would be a high priority in areas damaged by the attack. GAO has health care and city public works centers on their responsibility in these areas. Emergency equipment—including generators, pumps, and other equipment and parts—will already be in place at 24 hours after the attack. To emergency staffs and crews to bring supplies, the federal government will set up mobile health to repair and treat local personnel.

Any emergency emergency equipment, personnel, and emergency talent with a control to control (includes) and (includes) This will

about" from (includes) (includes) **Quadrants** The plan includes (includes) in a (includes) (includes) to clear (includes) quickly.

HEALTH SERVICES will present one of the greatest post-attack problems. Even with effective sheltering, an attack would leave many people injured and sick. Physicians, nurses, hospitals would be lost, and heavily in the areas with most casualties. And in the aftermath of attack would cause injuries and disease.

The U.S. Dept. of Health, Education & Welfare has designed a basic package and for an (includes) but effective (includes) general hospital. Some 1,000 of these units have been bought and placed in critical areas away from likely targets. Plans are under way to distribute another 750 units and to equip all of them with 30 days supplies of medical equipment and supplies. HEW is also responsible for supplying plasma, serum, essential drugs, supplies.

To effect a shortage of doctors and nurses at least partly, HEW is studying a program called "Medical Reserve." This provides (includes) training in first aid and general medical treatment. The course will be given to civil defense groups and industrial disaster organizations.

THE RECOVERY PLAN: What needs to be included in it?

Planning for recovery from a nuclear attack takes an almost staggering effort of imagination. You must try to visualize the shattering of our complex civilization, the breaking of the many links that tie our economy together (below). If you are to plan at all, somewhere you must picture the problems which would ensue for your company and its people—and prepare now to cope with them.

Problems of the early post-attack period would be basically similar to the problems of survival. So they could be tackled best by the same organization—which would be in control not only during an attack but in the weeks after.

After the assault, trained workers should be able to ferry heavily run plant areas that have been damaged, or contaminated by fallout. They should work in relays, to expose each team member to minimum radiation. The purposes of such trips should be solved by priority spelled out in your company's plan; at first, the goal should be only to take steps that would make shelter life safer.

Decontamination would be a major problem, particularly on roads and on land near the plant. An automatic flushing system, drawing to a safe distance, might help clean roads; as mentioned earlier, a shielded bulldozer could scrape contaminated soil away from buildings. These chores must be under industrial control.

A related job—subject to the same careful controls—would be removing debris from possible fire and blast

damage and making repairs. Here again, priority should go to steps that would yield the most immediate benefit.

You must assume that you would perform be self-reliant for some time after an attack. But you would try to look up to other as possible with self-organized groups. You should be equipped to test your water supply for radioactivity and possibly with a certified test kit.

Information needed. You should plan early efforts to contact others in the community—the most obvious groups, disaster aid groups, neighboring plants that might offer—or need—mutual aid. In this immediate post-attack stage, there would be a desperate need for information. Employees would want to know what happened to their families, their homes, the community; you would need to know about local supplies of food, fuel, and other supplies, about conditions, about regulations to keep low and order.

In some nations with extensive civil defense plans—Sweden, for one—martial law takes effect as soon as an attack warning sounds. U.S. plans thus far make possible do not call for martial law—although it would seem possible, instead, the approach has been to try to manage that local and state governments would continue to function. Federal agencies have already done a great deal toward specifying emergency lines of command for officials, setting up alternate headquarters or backuping, present staff, preventing potential losses. All but five states have taken such steps.

later steps along similar lines, although only a few have considered such programs.

Despite these steps, law and order could break down in some areas. So your company's plan should provide for handling such problems both inside and outside your plant. On the outside, your organization should help restore order to the community. This requires close integration of your group and local civil government.

Long-term plan. For the long-term recovery of your company, you face planning problems different from those of survival during and immediately after the attack. Long only, then, you should assign such planning to a separate group, newly drawn from top management. This committee's primary worry would be outlining steps to take, in advance, to preserve the company's organizational structure and the assets—intangible and tangible—on which it depends.

The layout of most companies tightly limits the bonded of recovery—where it may start, what constitutes a quarter, how new disaster areas are created, and so on. Such restrictions might make it legally impossible for the company to carry on if a massive disaster should wipe out many divisions or resulting transportation needs should prevent a quarter.

To correct this, your plan should include a bylaw changes to permit surviving divisions—or even a single division—to

to all resources without delay, pending a regular or special shareholders' meeting.

You might also consider an emergency management committee, empowered to act for the limited of disaster under specified conditions. Any such steps should be based on careful legal study. Some states have modified their laws to give you more flexibility—or as plan to do so—but others have not. A good starting point for your program: the Information on corporate continuity published by the Office of Civil Defense, industry and trade associations, and other such groups.

As a next step, you should review all company functions in the light of probable conditions during the recovery. From this review, you would be able to pick the most essential jobs and assign them among the company's staff—with succession named for each post. This succession, too, may require bylaw changes.

For recovery, a company would need essential records to continue operating. Storing them safely would be the most difficult problem; much more difficult is deciding which records are truly vital. Some difficulties are discussed, drawing them routinely into three categories:

- **Final records—irreplaceable**; if lost would be irreparable harm, necessary to recover assets promptly or to restore production, sales, and service.
- **Important records**—very expensive to reproduce, in dollars or time.
- **Useful records**—whose loss would be inconvenient, but could be replaced readily.

Records with the following would probably qualify for safeguarding: property; assets and other proofs of ownership of assets; shareholder data; insurance certificates;

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FEDERAL AGENCIES AND CIVIL DEFENSE

By executive order August 1, 1950, the important transferred from responsibility for civil defense from the former Office of Civil Defense and Mobilization to the Department of Defense. With its remaining functions, DOD was renamed Office of Emergency Planning.

Specifically, the Secretary of Defense is in charge of development and execution of a program to minimize the effects of attack, including warning and evacuating industry and the public in methods of survival. This includes a mass shelter program, a warning and communication system, and a program to avoid, delay and limit damage in such post-attack community services as health and sanitation, maintenance of law and order, firefighting and control, debris clearance, traffic control, provision of water supplies. The Director of the Office of Emergency Planning is responsible for planning continuity of state and local government, the national disaster alert program, the defense mobilization program, the strategic and critical materials stockpiling program.

Previously established policy calls for making maximum use of

existing Federal departments. Typical civil-defense responsibilities that are assigned to other agencies include:

Dept. of Agriculture: Food stockpiling, food fire control, protection of vegetation and animals against radiological, chemical and biological hazards.

Dept. of Commerce: Restoring streets and highways, use of emergency shipping.

Dept. of Defense: Agency Emergency use of civil air transport, civil airports and airports.

Dept. of Health, Education, and Welfare: Medical stockpiling, use of refugee fire attack, including location services.

Dept. of Interior: Emergency plans for power and petroleum.

Dept. of Labor: Planning use of emergency manpower; control strikes, in essential post-attack periods.

Post Office Dept.: Registration of individuals and families.

Housing and Home Finance Agency: Emergency housing and one month services in the post-attack period.

Interstate Commerce Commission: Plans for use of domestic service transportation in emergency.

potents, important engineering drawings and process data, records of employee personnel (cards and other such financial plans), important contracts, including union contracts. These would also have to be kept up to date, of course.

If you carry on business at several widely separated points, you should have duplicates of vital records at each location. You should also arrange for management personnel at each point to take control of company operations at other locations, if necessary. Plans should also be made for mutual aid between the several plants and offices.

In some cases, you should consider establishing alternate headquarters, with duplicate records and living quarters. This could give a company the advantages of a larger company with dispersed operations.

If an attack struck when employees were not at work, they would need to know where to report when conditions permitted. One answer would be to designate emergency centers, possibly in suburban homes of supervisors.

Fireed plans. Your plan should set up emergency financial procedures. For example, you would probably need a simplified accounting system for use after attack. You would want funds quickly available for wage payments, advances to employees, and buying food and supplies. One solution might be to prepare checks of fund disbursement and disbursement checks. They would be stored in a safe place and used only in emergency, with the signature of anyone of a list of management personnel.

Finally, you must try to prepare for restoring production in an emergency economy — probably with wage and price controls, government allocation of materials and manpower, and so on. Production would quite likely be geared to goods most useful for recovery.

You would want to analyze how your company would be suited to alternate lines of production, perhaps develop alternate sources of supply, and production techniques to make your operations as flexible as possible.

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THE TASK AHEAD

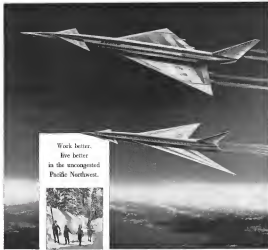
If our nation should suffer a large-scale nuclear attack, the measure of our ability to survive and recover will be the courage with which we appear the dangers, and the vigor with which we act to prepare for them.

In such planning, business and industrial executives have a special task and exceptional responsibilities. The organizations they direct not only provide the sinews of the economy on which recovery would depend, but can — and should — provide focal points of direction and leadership.

Some companies have already displayed commendable foresight and enterprise in preparing for the possibility — however unlikely — of nuclear war. But a big job remains to be done. I urge every responsible American executive to give these problems his immediate and earnest attention.

Robert S. McNamara

Robert S. McNamara
Secretary of Defense



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separated polar orbits, Navy believes it will be possible to get Transit positions fix anywhere on earth at intervals of not more than an hour and a half. In Arctic and Antarctic latitudes it may be possible to acquire fixes two to four times more frequently because the

Antilife equipment away and the presence or perturbation of the orbits may cause gaps to open up in Transit coverage of the earth. To correct this, other Transits will be launched as necessary.

Starr anticipates that the set of vital lines will have to be reauthorized about once a year.

Tracking stations on the natural satellite ground net will be precisely located and will have equipment similar to the high accuracy installations aboard Navy ships. The stations have not been

located yet but they will be in the vicinity of Winter Harbor, Me., Moosehead, Maine, Pt. Mays, and Pearl Harbor, Hawaii. The Transit Operations Center, Computing Center, and data reception command transmitter will be located at St. Merys.

Coded Transmission

Each aerial craft will function by transmitting a precise coded description of its own orbit along with an accurate time reference signal as two extremely stable GHF carrier frequencies. The same frequencies will be generated at the shipboard and aircraft-based navigation receivers and the wavelengths of the received and retransmitted

frequencies will be compared to measure the Doppler shift of the former. The coded orbit description will give the navigator an orbit path whose position is known and the times at which the satellites will be at every point on that path.

Tessie's Account

This exact trace of the sailfin's chord approach to the mooring will be mirrored when the dropper shaft passes close to the mooring and is located perpendicular to the shaft path down through the position of the sailfin at that exact time. This slope of the Dropper shaft curve with respect to track is steeper if the sailfin passes close to the ship, therefore the angle of the slope can be interpreted as a measure of the distance between the mooring and the sailfin's point of closest approach. This enables the navigation officer to plot the point on the perpendicular line which represents the ship's mooring.

Except for the rotation of the earth, there would be two points on the map, one on each side of the orbit path, which would receive identical signals. However, the west-to-east movement of the earth's surface introduces a latitude-dependent time-varying moving one point toward the orbit path and one point away from it. This gives the two positions different shaped Doppler frequency curves and discriminates the magnitude from the fix. The more complete high accuracy, modifications will correct the Transit transmissions and read out

longitude and latitude immediately.

The bus handling stations of the Naval Automatic Service Group will receive the packets and from them accurately locate positions will measure sea deviation of a missile from the target that in coded messages describe the missile's position and velocity. They store this data in the PL Mages General Control console when an IBM 7090 general purpose computer will update the orbit parameters and the data according to transmission will cause the existing orbit parameters to be compared with the previous station and simultaneously with the new one. As knowledge of Transit orbit parameters increases, program of flight before it will be possible to use a smaller more limited computer. There will be three opportunities a day to accept data from the PL Mages stations. The PL Mages range on a north-south track and over on a north-south track. If more opportunities as greater reliability is needed, a second data reception transmission may be combined later at

Refraction Experiments

The biggest error in the Doppler signal received by tracking stations and navigation are caused by the refraction of radio frequencies by the atmosphere. Applied Physics Laboratory has developed a technique of removing first order refraction errors. It is this that makes it necessary for the satellites to transmit on part of harmonic frequencies. The technique is based on the fact that the degree of radio refraction

by the isospectrum varies with frequency. Because of this, simultaneous transmissions on different frequencies will arrive at the receiver at slightly different times. The API-designed selection correction unit measures the reception-time difference and algorithmically calculates a correction which is incorporated in the output.

The mean difference in performance between high and moderate accuracy installations is due to the absence of a selection correction used in the latter. Moderate accuracy installations do, also slow because competition and random are not necessary as in the high accuracy installations. Navigators must rely on slide rule or desk calculator methods.

Stable Time References

The stable trace substances in the Tinseltown articles will give navigation a more accurate indication of how fast the signals transmitted by the Navstar Division over its radio station WOPV will take anomalous effects upon the time of transmission will be less for the shorter propagation paths. Good is an accuracy of 180 nanoseconds or less. The Tinseltown trace signals will be compared with the master time reference of the observatory once a day when each satellite passes overhead and any error discovered will be incorporated in the next day's correction from the station.

A byproduct of the Transit program will be the availability of this world-wide accurate time reference for scientific research and other activities not

completed with navigation. When Pacific Missile Range submitted a proposal to implement and staff the operational Transit track, it was met with partly by great acronyms before. For instance, the Transit line stations would make possible more precise earth orbits with the Atlantic Missile Range and among other stations. A very important legend is the supposed knowledge of the shape of the gravitational field about the earth that can be expected from the continuous release of satellite orbits with the sea.

Coopers is one of the most important studies in the restructuring phase of Tumor development. Since growth



Astronaut Wings

Delaware Department has permitted its own's wings to Navy, Capt. Alan B. Stapp, Jr., and Air Force Capt. Virgil E. Gaudin both of whom made inflight flights in Maryland this year. Design of the wings for both the Navy (left) and Air Force (right) includes a shooting star superimposed on center's wings of the carrier. Qualification for the wings is a flight of more than 100 knots.

1/2-oz. Rocket Designed For Orbit Correction

Liquid propellant rocket engines are a hundredth to a tenth of a pound of thrust a being developed by Aerojet General Corp. for attitude control and orbit correction of space vehicles and is intended to meet performance and weight requirements midway between those met by plasma jets and cold gas jets.

² Named Minnrocket, the device burns hydrazine and nitrogen tetroxide, which is a storable, bipropellant combination.

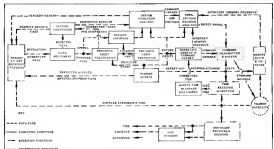
It is cooled only by thermal radiation and is designed for a chamber pressure of 10 psia. to 15 psia. The Minus rocket has a high specific impulse rate of 108 to 1 msec; it is to be operated only as a motor.

All of the test songs we done in a various facility at the Acoustic Arena, Calif. about

Combined weight of the thrust chamber and the injector equals a full canister.

Interior consists of a pair of small, by padlock needles with the rear chord and a 0.18 in. hole drilled into the side of each at a right angle. Vent openings 1/2 inch apart have been made and the engine is planned for maximum running at 2000 to 2500 rpm. The Micro-sifter has the capability of running for a day on approximately a gallon of petroleum.

There is no threat moment for the producers. Micromarket.



OPERATIONAL TRAJECTORY SYSTEM provides continuous information loop which uses Doppler tracking data to compute updated ephemerides for the satellites. A new determination of the ephemerides of each satellite is then broadcast in its customary downlink pass.

Prototype Combat Tested in Anechoic Chamber

Full Service measurement satellite prototype of model planned for launching next spring is shown undergoing tests in a radio anechoic chamber at Bell Telephone Laboratories. The 34-in.-diameter satellite has 72 pins for feeds, some of which connect solar cells protected from space radiation by vacuum-sealed mylar-glass plates.



Recent Soviet tactical missile shown in firing position ahead of Soviet forces, has 30 mi. range. Background of picture has been later introduced to the immediate right of the tracked vehicle and in vicinity of tree. Vehicle has seven solid propellant motor nozzles (and six, conventional nozzles). It is transported and launched from reinforced continuous vehicle with an independent power supply.

Soviets Display Tactical and Anti-Aircraft Missiles



Three tactical missiles (same type as above) missile being a ridge on this tracked carrier during maneuvers with the Red Army. At right two Russian soldiers in field corps uniform maintain a 30 mi. range tactical missile preparator to firing. Transporter launcher vehicle is a tracked, amphibious medium-sized type apparently standardized for artillery-type units.



First pattern of Russian anti-aircraft missile during field tests show few details of this early weapon, now being supplanted by a larger and longer-ranged unit. Missile has been shown in parade since 1957.



10



Raytheon solution for space

Recovery of space vehicles is a long range problem, commencing at atmospheric entry. Techniques for control from re-entry through touchdown, developed by Raytheon, are comparable to GCA concepts. Over the past two years, Raytheon has conducted a major and continuous investigation of the means by which a manned maneuverable space vehicle can be returned safely from flight in space to a normal routine landing on earth. These investigations have included operational

control concepts, instrumentation, information flow analysis, basic system requirements and subsystem specifications.

Part of this effort was a space vehicle recovery study for the Air Force Flight Test Center encompassing vehicle energy management, glider characteristics, trajectory analysis, flight parameter accuracies, range instrumentation, navigation, communications, data processing display, and human factors.

vehicle recovery: LONG RANGE GCA

Other portions of the effort included earth return navigation and recovery studies for SLOMAR (as a subcontractor to the Martin Company), and joint efforts with Bell Aerospace Company on DYNA-SOAR Terminal Navigation Systems.

Currently, major emphasis is being placed on the APOLLO Ground Operational Support System (GOSS). This system will include global range instrumentation for tracking; telemetry and communications;

and control, display and computation centers.

One of the world's largest scientific/industrial organizations, Raytheon has proven capability to create the required technology and manage every phase of a space vehicle recovery system — from early study and design through development, production and field support of operational systems and equipment.

Executive Office, Lexington 75, Massachusetts.

RAYTHEON COMPANY

EQUIPMENT DIVISION

RAYTHEON

Communications, Radar, Sensor, Guidance, Data Processing and Display, Countermeasures, Systems Design and Management, Basic Research

Aviation Week Pilot Report:

Automatic Landings Performed in TF-102

By William S. Boyd

Palmbeach, Calif.—Autonetics approach and landing system developed by North American Aviation, Anaheim, Calif., has completed contractor flight testing as a Cessna 441Q. After that, the Air Force certifies the AFN 310 system will undergo Picked Avionics Agency flight tests.

During final phases of testing the Aerostar Ultra pilot along with Auto-archer experienced test pilot R. L. Co. has made through in full automatic landings in T-102A No. 95-602. The AFN-114 controlled the aircraft from the ILS water supply through touch down performing landings which, while not as smooth as those which can be made by a pilot were as all over as possible.

Developed under Air Force contract for the Flight Control Laboratory, a USAF Aeronautical Systems Division, the AFN II is a system in development for the X-30 Mach program. Since the focus is on Antares as a Concept T3, it is a baseline from the Air Force. During the flight test program, command is Antares, not the X-30.

landings were made with the APN-014 system. Of these, about 10% were hooked blind landings from acoustically using information the system feeds to the hooker during the approach.

Success has been achieved in landing the aircraft unassisted, or manually, about 60% of the time. Antecedent conditions, including the early flight during which bugs are worked out of the system. Success rate improved steadily as users, data and experience were gathered with the system.

Transatlantic, gone to the final end of Antarctic test program in mid-November: a Boeing test pilot made eight successful autonomous landings out of eight attempts while gathering data on the system. A commercial version designated VandeLiner will be flight tested on the Boeing 737-50 prototype next month.

As Fovea has established that the system has been brought to the point where it is suitable for transfer, meaning that it meets all the design to Wright Patterson ATD Ohio, whose further testing will be done. At a later date, the TP 102 coupled with the Autonomic APM-114 will be flown to the

FAA's National Aviation Facilities Experimental Center at Atlanta City S. I. for further evaluation.

Though operating under conditions considerably less than ideal, acceptable landings were made in all cases during the report's flight. Two landings were made in Edwards AFB, Calif., the remaining four when the landings were shot at Orland AFB, Calif.

Given these findings, moving out of the surfacings at 25 kV produced the most consistent situation at Edwards airbase, especially on ILS-equipped Runway 22 had to be made downward. Despite this, however, the two landings made at Edwards can be described as accept- able. Cluttering traffic which would have preoccupied some looking at low altitudes, disturbed a string of landings and the result was a flow to Donald MFB where a landing on the ILS run- way would be well into the wind.

Conditions at Dorval presented hazards with traffic on Runway 2 against a 22 lb wind out of the north east flow, although conditions were not as severe as at Tille rail, the runway surface was moderately textured due to strong gusty surface winds.

A wind shear apparently existed about half way between the outer marker and touchdown at about 500 ft. Because strong updrafts caused a speed increase of about 20 kt on approach in the APV, 114 meters height "ballooning" took place at this point.

This by its findings at Grand view substantiated, despite the strong, gut-gut feeling associated that were by no means equal in kinetic to those which could have been made by an experienced pilot. In each case the aircraft landed in the runway, but not always close to the centerline or faced up with the run way heading. Although it could be said that the findings were substantiated, apprehension was experienced at its whether or not the aircraft would struggle out in time, whether it would sink off the runway, whether it would crash or burn, etc.

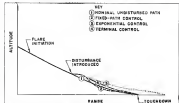
One thing becomes readily apparent: The system cannot outpace possibilities as an experienced pilot can. London, a Cofem-series aircraft in gusty wind requires that possible disturbances be anticipated by the pilot. This anticipation, which comes only from experience, requires that a pilot follow an automatic rule or condition dictate. Response to disturbances while the aircraft is in landing attitude must be much more rapid than when the aircraft is at cruise or even liftoff, not to mention the

The automatic system's response rate is increased as previously in the ground increases but the system is not capable of the relatively unstable grip possessed by a good pilot. However, the fact that the system can consistently load the TP 102A under less than ideal conditions is a certain positive stride in the direction of automatic loading. Automatic engine results, again, find the system is not ready for all-weather applications but are it does offer a benefit that could be used to investigate the problem.

Autonomous started with a basic TT-103A, equipped with a Hughes M610 flight control system with IRS complex. To this was added an Emerson radar altimeter, inertial site of descent system, terminal control computer, automatic speed control, control stick steering, brakes, spoilers and other mechanisms. The Hughes autopilot as well as the approach computer were modified to accept the signals of the flux computer.

Signals from the barometer and glide slope, under instrument, rate of descent (RDR) and aircraft instrumentation are

HF-100A No. 15 4001 taxi out for a series of automatic landings at Tuleville Airport



THREE TYPES of automatic flaccant are illustrated in this drawing. No. 1 shows a normal unbraked fire path. No. 2 too represents the fire path obtained with a fixed path control method. A wide steady disturbance with this system could cause severe ground impact. No. 3 exemplifies the exponential control system which compensates a discrete time proportional to the existing straight attitude. Translational point is greatly affected by the influence with this system. Line No. 4 shows the forward curved attitude used in the Lockheed APN-114. Translational point is not greatly affected by disturbances.

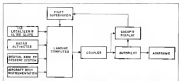
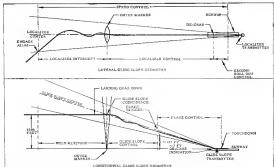


DIAGRAM of M/V 314 depicts how pilot has experience with functioning of computer

lived landings is a tricky problem, according to Glendon, who has made sexual with a safety pilot aboard.

The Autofuze gas sensor works on a new basis whereas it provides signals to the autopilot or cockpit indications to select a landing when a specified time period is differentiated from detecting the aircraft along a predetermined path.

Length of time from flame fringes at the leading edge to backflow gases from 12 to 18 sec. is the time dimension of the possible aircraft. The flame-backflow time for the



LONGITUDINAL and lateral geometry of an arbitrary beam and controls is detailed in the above drawing.



COCKPIT INSTRUMENTATION for the American AN-116 centers in the TP-102A includes the following: (1) Altitude director indicator (ADI), (2) Horizontal situation indicator (HSI), (3) Radar altimeter and sliding air meter, (4) Speed brake position indicator, (5) Fuel/air lights (top to bottom: Fuel, Flare, Deceler), (6) Control panel. Once the briefing has been explained the pilot turns on the Automatic Instrument Landing Approach System (AILAS) switch (7) and the system does the rest.

TP-102 is about 12 sq-ft, larger than for fighter aircraft. Therefore most of trackdown will run, slightly according to wind velocity. A tail wind of 10 kt, the maximum the system will tolerate, will result in trackdown 600 ft further down the runway than a no-wind condition. Similarly, trackdown will be 600 ft down of the no-wind point if the aircraft is heading a 10 kt headwind.

Procedures of the aircraft have an ideal glide path in an approach, whereas such as gain, wind or from pilot or gets does not necessarily affect the trackdown point nor will it result in unnecessary changes or adjustments at actual clearance. Rather, the computer automatically calculates a new path to the required trackdown point without having the aircraft to return to the "ideal" path. From whatever position in which it happens to find itself, a new path is programmed to the required track down point.

Part of the program. North American engineers designated an indicator on the instrument control system to park the "outside" down, no matter how high. This is despite the trackdown of some pilots to "back under" the ILS glide path once visual contact with the

runway is established. This function is due to large part to a device not in "auto" on, runway and since the COGN or ILS trackdown point generally is about 1,500 to 1,600 ft from the runway threshold, some pilots do not want to continue with the actual glide path. They cut power and land as soon as the end is possible. This generally results in a glide path profile resembling the bottom contour of a spoon with the handle at the flareout point.

Despite this practice, that during under the glide path if the visual contact point pilots understandably are agreed the runway being performed by an automatic device. Similarly, pilots prefer that automatic system start the flareout maneuver sooner than they themselves would start it. One test pilot and the computer was convincing to land, the glide path later than the flareout maneuver. However, to watch the runway pilot's assets, the system is programmed to commence the descent maneuver at approximately the same time that a pilot would be thinking about starting to break the glide

Procedure, and during this, an auto-cutoff landing. However, WFRs ride through near the time.

• **Landing beam** is interrupted at a point behind the outer marker 1,100 ft above the runway elevation. Capturing of the landing beam is facilitated if the intercept angle is kept less than 45 deg. because less "backsteering" is required. Approach was reduced to 210 ft with landing gear up and speed brake on.

• **When** landing needle indicates that beam is being captured the Automatic Instrument Landing Approach System switch (AILAS) is closed. At this time, the system is still under the glide path as indicated by full up displacement of the needle. Bank is limited to 15 deg prior to full slope intercept and to 15 deg thereafter.

• **Landing gear** is lowered when the glide slope needle is half way between the upper peg and center. Reference speed at this time is reduced to 175 kt and power is set at about 55% rpm. (Speed is maintained to zero-wind, modulating speed brake pressure. Throttle control can be employed in the system but proved to be troublesome because too little data is

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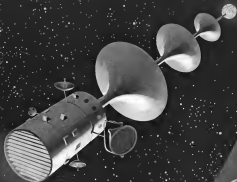
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FACING THE FOURTH DIMENSION IN PROPULSION DEVELOPMENT

Whether the vehicle has a "bottle shape," or any shape at all, is a matter of interesting conjecture. The matter of space travel, however, is the subject of intense experimentation. A nuclear/thermionic/ionic propulsion system, currently being studied at Lockheed Missiles & Space Company, might well become the power source for space vehicles.

Its design incorporates a nuclear reactor only one foot in diameter, generating heat at a temperature of 1750°K. This is transmitted to banks of thermionic generators, converting the heat directly into electrical energy for the ion beam motor which uses cesium vapor as a fuel. The entire system is designed without any moving parts, minimizing the possibility of failure.

Lockheed's investigation of propulsion covers a number of potential systems. They include, plasma, xenon, nuclear, unique concepts in chemical systems involving high-energy solid and liquid propellants, combined solid-liquid chemical systems. The fundamentals of magnetohydrodynamics, as they might eventually apply to propulsion systems, are also being examined. Just as thoroughly, Lockheed probes all minute and gross difficulties in depth. The extensive facilities of its research and development laboratories—together with the opportunity of working with men who are acknowledged leaders in their fields—make research with Lockheed truly rewarding and exciting.

Lockheed Missiles and Space Company in Sunnyvale and Palo Alto, on the beautiful San Francisco Peninsula, is an exciting and challenging place to work. For further information, write Research and Development Staff, Department M-244, 325 North Mathilda Avenue, Sunnyvale, California. An Equal Opportunity Employer.

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available on open seas may be far from ideal. However, changes of course at various sea levels and the effect of speed on the two parameters alone. Using a normal throttle setting and then varying down to control speed, watercraft will not lose direction, to pilots their constant power changes appear on the leading up pitch.

• **Flare control** is required at an altitude of about 100 ft above the runway. Obstructions in buildings generally cannot trigger the flare previously caused due to the influence of the rate of descent which causes out-of-phase descent. Also, a speed results in over a close interval when down to 100 ft.

• **Adverse control** is obtained from the location below even after the glide slope signal is being disrupted by the pitch axis. During power is reduced on a preset schedule automatic call.

• **Turbulence** occurs in a two-high altitude at about 100 ft, as low and the waves roll out the aircraft down with a rate of descent of less than 2 ft/s. Directional control is maintained by the roller through lead-in signals down to constant radius effects over speed, usually about 70 ft. At constant speed, correction can be put in by the pilot as the deck light comes on at an altitude of 7 ft.

Failure Warning

Failure in the system at any time is designed to cause disconnection of the "Fail" light on the instrument panel. Additionally, every effort has been made to eliminate landing gear approach problems. Failure generally results in the aircraft landing in main, two altitude. A weak link is designed on the wheels allowing the pilot to disengage throttle control. In addition, the system can be manually disengaged from the control system by the pilot at any time.

In addition to the normal three ground checks on the system prior to flight, a self-test feature is incorporated which can be activated any time the aircraft is above 1,500 ft. When self-test is activated, power inputs in the flare computer are removed and replaced by simulated voltage. A check of voltage levels in flare computer at various low points in the flare computer. At any one of the voltages is not of tolerance, the failure light illuminates.

One obvious problem emerges from discussion of widespread use of the Redline system. How reliable is it? The answer is that it is safe to use in the ship context. The system is an item which can be exercised any time before the aircraft reaches the runway given a positive indication that the system is functioning properly. Additionally, the sys-

tem is designed to fail progressively rather than catastrophically. The worst that can happen is that it will give an indication of a zero rate of descent resulting in a maximum performance to a go-around.

A very real problem, however, is low confidence in an automatic landing system can be built up so that in the first instance of landing in systems conditions the pilot will trust the system. The obvious answer to this is to have the automatic system used on each and every landing made. Should the system prove to be reliable in the extreme and perform satisfactorily on every landing over an extended period, at least fail in such a manner when it does fail that the pilot can take over without endangering his aircraft or passengers, then he will have confidence in the equipment. But, all pilots are

convinced with their profession which must be maintained to the degree necessary to pass personnel checks by the FAA and company chief pilots. It is not approach and landing is performed by automatic equipment, the pilots will suffer on loss of confidence. Such a condition exists as the use of automatic approach complex with which most airline transport aircraft are equipped. The pilots have proved experience in the use of automatic and transition to manual proficiency, are reluctant to allow the automatic equipment to complete their approach to keep their hand in. The answer to this is education, flight tests of the equipment to which pilots and assignment and then become completely confident. Just what the answer is must await the development of a practical, applicable system.

PRODUCTION BRIEFING

New flight duration record of 97 min. for a QJC-8000 (Pittsburgh) jet target drone was set recently in Tropic, N.H., during a target exercise at 45,000 ft altitude. Retrieved from the Gulf of Mexico after fuel depletion, drone was capable for score.

United Bros. Construction Co. and Todd Shupard Corp. have been awarded a \$115,180 contract to build, install and check the test facility, called for by the Navy's Complex 37 at Cape Canaveral, Fla. The two companies joined to bid on the project to be completed in six months.

General Electric C6101 turboprop engine of the J45 has received FAA type certification. The C6101 (2,650 lb thrust) will power the P-300 Douglas, B-200 and A-100. The C6101 (11) Jet Commander executive aircraft. The C6101 (18 (2,600 lb thrust) will power the Sea-Armament Aircraft Corp. SAAC-21.

Heaver Co.'s Electronics Division, Timonium, Md., will design, develop and manufacture electronic equipment for the ground-based portion of the Minuteman ICBM under a new contract approximately \$175,000 from the Boeing Co.

Rohr Aircraft Corp. stockholders have voted to change the company's name to Rohr Corp. in recognition of the Clark Vint, Calif., firm's expanding efforts in the overall aerospace field.

Douglas Aircraft Co.'s Missile and Space Systems Division has awarded contracts totaling about \$2 million from Lockheed, Martin and Space Co.

and Radio Corp. of America to build clouds and gas tables for several Agency B projects. The cloud towers will shield Weather weather satellites. Several other communications spheres and other systems will be installed. Lockheed, Martin, and other companies are working on the project.

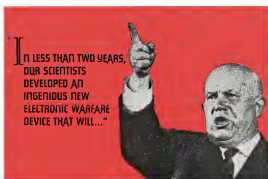
Consolidated Aircraft Co., Wichita, Kan., has received a \$1.2 million order from the Republic of Argentina to produce the model and other aircraft components for the Republic F-101 Thunderbolt.

North American Aviation, Inc., has received an initial contract of \$1.7 million from the Air Force to begin manufacturing F-105 tactical fighter aircraft.

E. W. Bus Co.'s Heavy Equipment Division, Canton, Ohio, will furnish aircraft engines and aviation fuel for the Marine Corps Air Wing under a \$100,000 Navy contract. Equipment is designed to permit aircraft operations in forward areas where fuel supplies are not available.

Aircraft Mfg. Co. division of the Gemini Corp., Los Angeles, will supply aircraft engine parts for the B-57B military aircraft under a contract totaling \$150,000 from the Boeing Co.

Third prototype of SM-67 turboprop engine of the M-4500 Flagship, built by GE, of Danbury, Conn., was recently demonstrated to General Electric officials. Tests of the engine (AW July 31 p. 109) are expected to begin in mid-1962.



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Second Visual HC-1B Chinook helicopter for the U. S. Army comes away from 3,000 lb. of flight test instrumentation.

Photos Show Details of Army's HC-1B Chinook



Chinook cargo is loaded by rear ramp built with tie light vehicles, axles and cradles of field Army weapons. First flight test aircraft is tested on various attached aids to check load flow with rotor spinning.



First Chinook built is hoisted slowly for endurance tests of dynamic loading, development test is continuing. Below, rear head is fitted with "photopack" assembly of alignment to handle. Main rotor-pipe wiring to instruments is also.

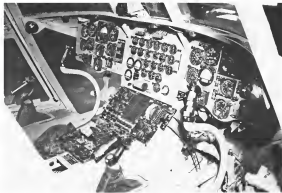
First details of Sikorsky's HC-1B Chinook helicopter, being produced for the U. S. Army, are shown in these photographs of the first and second aircraft.

First Chinook built is a testbed aircraft, being used to evaluate dynamic response. Second HC-1B is the first flight article, a substantial aircraft for various steady state and structural investigations. It also carries extra payload, associated instrumentation can handle up to 120 readings to recorder in the Chinook cabin.

Chinook is powered by a pair of Lycoming T55-L-7 turboshaft engines rated at 2,250 hp each. Gross weight is 51,800 lb., and cargo capacity exceeds seven tons. Helicopter has provision for, can carry 33 troops.



Two cyclic stick mounts switches for stick-rotating device, communications, cargo sling release and automatic flight control system. Collective stick holds switches for speedbrake control and for speed trim of both engines.



ENGINEERS

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NEW VTOL CONTRACTS

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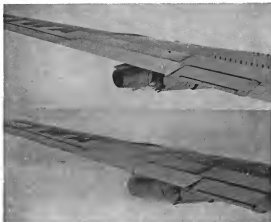
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Boeing 720B Passenger Photographs In-flight Mishap

No. 2 engine of a Twin-Wing Airlines Boeing 720B was damaged over Albany, N.Y., en route from Los Angeles to Boston when bolts were broken in the engine disk during NAW No. 15 p. 150. Metal shrapnel in the engine passed the passenger cabin at the cost rack, causing loss of pressurization. Airplane was grounded the wing, causing fuel leakage. Fuel spray and noise caused major air sick in bottom cabin. Passengers were taken to a hospital, R. F. Minsky, of San Francisco, Calif.

NASA Contracts

Recent contracts and research grants of \$10,000 or more awarded by the National Aeronautics and Space Administration:

RESEARCHER: Washington D.C.
William Jay Thomas, Director, Dept. 477-21—\$10,000 in March 1962—\$10,000 in August 1962.

John, Research & Technology, Washington D.C.—\$10,000 in March 1962—\$10,000 in August 1962. NASA's contract is awarded to the research subject the studies of aircraft motion. Research & Technology, Washington D.C.—\$10,000 in March 1962—\$10,000 in August 1962. NASA's contract is awarded to the research subject the studies of aircraft motion. Research & Technology, Washington D.C.—\$10,000 in March 1962—\$10,000 in August 1962. NASA's contract is awarded to the research subject the studies of aircraft motion.

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Can a Computer Recognize MOON GEOGRAPHY?



• Cornell Aeronautical Laboratory's engineers and scientists are investigating concepts for computers which can be taught to recognize patterns, whether these patterns be airfields, missile sites or even significant geographic features of the moon. In related work, CAL is developing special purpose computers largely aimed at use, yet better for the task than the general purpose computers in use today. These computers use novel delay line storage techniques to perform calculations in real time.

As a research tool in its cognitive systems program, a special JPL facility for the IBM 394 digital computer has been developed, allowing photographic data to be stored directly into the computer. This facility allows CAL engineers to experiment and evaluate pattern recognition concepts at an early stage in the research program.

Other computer related research activities include analytical and experimental research in data processing techniques, adaptive control systems, and trajectory routing techniques. Our scientists engaged in this research have extensive skill and experience in areas such as information theory, statistics, control systems, advanced programming, theory of automata and intelligent machines.



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Producers & Writers: William W. Bennett, Los Angeles, Calif.—\$10,000 for credits; holding and/or option rights.

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Jigs Built for B-70 Fuselage Sections

North American Aviation is completing jigs for fuselage sections of the B-70 Mach 3 bomber at the Fairbairn, Calif., plant. Fabrication of most major sections of the B-70 is under way. The B-70 is scheduled to make its first flight by the end of 1962.

Various characteristics of aircraft section for the other aircraft, including the fuselage, are being developed at the same time. The B-70 is scheduled to make its first flight by the end of 1962.

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can you recognize A GOOD OPPORTUNITY?



• A few previously well-qualified men will find work in opportunity here in Cornell Aeronautical Laboratory, Inc. as Computer Systems Engineers in our Computer Systems Department.

We seek applications from talented engineers, mathematicians and physicists with training or experience in the area of information theory, statistics, adaptive control systems, advanced pattern processing, computer theory, test analysis and learning mechanisms.

For full information, send resume only.



CORNELL AERONAUTICAL LABORATORY, INC.
at Cornell University

J. V. Sweeney, CHIEF, PERSONNEL LABORATORY, INC.
Room 211 New York

Send us a copy of your latest resume and information on your present position. A Confidential Source.

None

None

None

None

None

None

OK, Hugh L. Gordon

Professional Employment Manager,
Lockheed-Georgia Company
8334 West Peachtree Street
Atlanta 8, Georgia • Dept. NN-75

Here's What I Want...

ENGINEERS CHECK YOUR ANSWERS AND MAIL TODAY

- ☐ Opportunity for professional advancement in this industry.
- ☐ Opportunity to work on interesting and challenging projects, such as...
- ☐ Long career job security for lifetime.
- ☐ Full opportunity to utilize and capitalize on my education, which is...
- ☐ Full opportunity to utilize and capitalize on my experience, which is...
- ☐ Best overall educational background, such as...
- ☐ Income, such as...
- ☐ Professionally advantageous associations, such as...
- ☐ Freedom to work with less and faster for assistance.
- ☐ Desirable fringe benefits, such as...
- ☐ Company stability and prestige for its reputation.
- ☐ Pleasant living conditions, such as...
- ☐ Opportunities for further education for assistance.
- ☐ Recognition of personal contributions, such as...

Name

Address

Phone

To Join

THE ENGINEERING CENTER
LOCKHEED-GEORGIA COMPANY
A DIVISION OF LOCKHEED AIRCRAFT CORPORATION
AN EQUAL OPPORTUNITY EMPLOYER



CAB Accident Investigation Report:

Alouette 2 Has Power Loss Over Water

An Alouette 2 helicopter N 335 crashed and splashed by Pittsburgh, Pennsylvania, crashed in the Gulf of Mexico approximately 17 miles east and southeast of Corpus Christi, Texas, about 100 miles from the Gulf of Mexico. The pilot and the three passengers survived but injured. The aircraft was a total loss from impact damage and subsequent water immersion.

N 335 was used to transport personnel and supplies to various offshore drilling platforms in the Gulf of Mexico under a contract between Petroleum Helicopters Inc. and the Shell Oil Co. On Dec. 2, two normal flights were completed in accordance with the permit. During the flight, about eight minutes after a normal flight, the helicopter crashed in the Gulf.

Following an extensive search, the wreckage was located in the water, some 10 miles from the point of take-off. The time of the accident was approximately 11:30 CST.

Although there is a confirmed evidence to determine the probable cause, the available evidence suggests that the accident resulted from an inadvertent loss of control and loss of directional control. It appears that the pilot was not aware of the loss of control. The pilot was not aware of the loss of control. The pilot was not aware of the loss of control.

At a talk at the company, the FAA took corrective action by issuing Airworthiness Directives (ADs) to all Alouette 2 helicopters. The FAA also issued a recall of all Alouette 2 helicopters. The FAA also issued a recall of all Alouette 2 helicopters.

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N 335 was located by radar to ground at Block 12 and about 10 miles from the point of take-off. The pilot and the three passengers survived but injured. The aircraft was a total loss from impact damage and subsequent water immersion.

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SAFETY

Search Operations

Search operations began on Dec. 3, 1975, but were suspended until the wreckage was located. The pilot and the three passengers survived but injured. The aircraft was a total loss from impact damage and subsequent water immersion.

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No Structural Failure

No structural failure was found in the wreckage. The pilot and the three passengers survived but injured. The aircraft was a total loss from impact damage and subsequent water immersion.

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RELIABILITY ENGINEERS and QUALITY ASSURANCE ENGINEERS

Symposium Interviews
Washington, D. C.
January 9-11, 1962

STL's expanding Reliability and Quality Assurance Program has created positions with responsibility for the development, implementation and auditing of these programs for advanced weapons systems and space programs. Responsibility extends through all phases, including:

- Proposal Preparation
- Program Planning
- Hardware Development
- Procurement
- Manufacturing & Test
- Field Support

Representatives

Reliability Engineers—BS in Engineering or Physical Sciences with 5 or more years experience in aerospace or related industries including program, particularly including hardware design experience.

Quality Assurance Engineers—Post-grad degree from BS in Engineering or Physical Sciences with 2 or more years experience in aerospace or related industries in quality assurance programs—BS in Engineering with 10 or more years experience, including 5 years in quality assurance planning, and 5 years design engineering experience.

Suspension decisions stamped at head offices based by calling Mr. H. E. Stevens, Executive Director, Jan. 9-11 from 9:00 a.m. to 5:00 p.m. or send resume to Mr. H. E. Stevens at STL, an equal opportunity employer.

SPACE TECHNOLOGY LABORATORIES, INC.

P.O. Box 999447, Los Angeles 24, Calif.
a subsidiary of Fluor Daniel Washington, D.C.

SEARCHLIGHT SECTION

(Classified Advertising)

BUSINESS OPPORTUNITIES EQUIPMENT—USED or RESALE

UNCLASSIFIED ADS:

The following table is a list of ads for all advertising openings in this section. The table is divided into two columns: (1) Classified Advertising and (2) Unclassified Advertising. The table is divided into two columns: (1) Classified Advertising and (2) Unclassified Advertising.

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VACUUM CARBIDE COATING SERVICE
We provide vacuum carbide coating for all types of metal parts. We have a large inventory of vacuum carbide coating materials. We have a large inventory of vacuum carbide coating materials.

AIRPLANE AND HELICOPTER PROTECTIVE COATINGS
We provide protective coatings for all types of aircraft. We have a large inventory of protective coating materials. We have a large inventory of protective coating materials.

ADVERTISING SALES REPRESENTATIVE
We are seeking a sales representative for our advertising agency. We have a large inventory of advertising materials. We have a large inventory of advertising materials.

FOR SALE
We have a large inventory of equipment for sale. We have a large inventory of equipment for sale. We have a large inventory of equipment for sale.

BUYING Good USED Equipment
We are buying good used equipment. We have a large inventory of equipment for sale. We have a large inventory of equipment for sale.

is frequently the difference between having needed equipment or doing without it.

SEARCHLIGHT Equipment Locating Service

No Cost or Obligation

This service is aimed at helping you, the reader of "SEARCHLIGHT", to locate surplus new and used aviation equipment and components and, if necessary, to purchase them. (This service is for USER-BUYERS only).

How to use: Check the dealer's address to see if what you want is not currently advertised. If not, send to the specification of the equipment wanted on the coupon below, or on your own company letterhead to:

Searchlight Equipment Locating Service
P.O. Box 12, N.Y. 26, N.Y.
Your requirements will be brought promptly to the attention of the equipment dealers advertising in this section. You will receive replies directly from them.

Searchlight Equipment Locating Service
P.O. Box 12, N.Y. 26, N.Y.
Please send to the following address your requirements.

NAME _____
TITLE _____
COMPANY _____
ADDRESS _____
CITY _____
STATE _____

ADVERTISERS IN THIS ISSUE

AVIATION WEEK, JANUARY 1, 1962

AVIATION CORPORATION	1	BAIRD'S CORPORATION, THE—AEROSPACE	11	RESEARCH CORP. EQUIPMENT DIVISION	11
AMERICAN MACHINE & TOOL COMPANY	2	BAIRD'S CORPORATION, THE—AEROSPACE	11	RESEARCH CORP. EQUIPMENT DIVISION	11
AMERICAN MACHINE & TOOL COMPANY	2	BAIRD'S CORPORATION, THE—AEROSPACE	11	RESEARCH CORP. EQUIPMENT DIVISION	11
AMERICAN MACHINE & TOOL COMPANY	2	BAIRD'S CORPORATION, THE—AEROSPACE	11	RESEARCH CORP. EQUIPMENT DIVISION	11
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AMERICAN MACHINE & TOOL COMPANY	2	BAIRD'S CORPORATION, THE—AEROSPACE	11	RESEARCH CORP. EQUIPMENT DIVISION	11
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AMERICAN MACHINE & TOOL COMPANY	2	BAIRD'S CORPORATION, THE—AEROSPACE	11	RESEARCH CORP. EQUIPMENT DIVISION	11
AMERICAN MACHINE & TOOL COMPANY	2	BAIRD'S CORPORATION, THE—AEROSPACE	11	RESEARCH CORP. EQUIPMENT DIVISION	11

CLIP LOCKING TURNBUCKLES

NAS 615-801 SERIES

EMBRACING REPRESENTATIVES
 Adams Supply Co.
 9020 N. Jefferson Blvd.,
 Los Angeles 44, Calif.
 Adco Industries
 P.O. Box 1215, St. Paul, Tenn.
 N. S. S. Co.
 125 S. 10th Street,
 Minneapolis 24, Minn.
 J. A. Research Co., Inc.
 2140 E. 1st Street, St. Paul, Minn.
SPECIAL AGENTS
 Slide Lock at Bellows
 1215 W. Jefferson Blvd.,
 Los Angeles 44, Calif.

BELL & HOWELL
 615 Bell Building
 1100 Center Ave., Memphis 3, Tenn.

PROBLEMATIC RECREATIONS 99

A circle of radius 1 inch is inscribed in an equilateral triangle. A smaller circle is inscribed at each vertex, tangent to the circle and two sides of the triangle. The process is continued with progressively smaller circles. What is the sum of the circumferences of all circles?

—Continued

Add the equipment from our Products Marketing Department and you'll find you can remove the support and need none of your digital components, sub-systems and systems with accurate accuracy. To eliminate: monitor meters, clock tape readers, clock equipment, tape editors, card tape units, and accurate check-out equipment. More from Products Marketing Department, Litton Systems, Inc., Woodland Hills, California.

ANSWER TO LAST WEEK'S PROBLEM: The weights are opposite reciprocals of 3 and 9 inches, 4 mm and 6 mm, so they add to 10 mm at 9 mm, or 3 mm.

LITTON INDUSTRIES, INC.
 Beverly Hills, California

LETTERS

Airline Motivation

As a regular subscriber of your excellent magazine, I found your editorial on the Hudson as drastic as your Dec. 4 cover story's suggestion.

I had that in your enthusiastic effort to support of this concept you assisted certain individuals and others involved.

First let me say, that in spite of the fact that our society undoubtedly needs the witness of a large segment of the national public, there are those of us also opposed to the combat division, speed and entering to be had as first-class fighters. In one case that unopposed approval of this new service seems proposed by the fact that it serves the public interest as well.

[illegible]

New York State and local officials are anxious to strengthen its claims. Northeast has economic permanent rights in some fishery areas, but the state has no jurisdiction. The lawyers did not say if it wanted to be directly involved in the public interest, but the issue that Northeast's right to be heard is not the same as the one that the state has. The state has concluded that this does not mean that the public interest being served in that case is an effort and not the same thing. The state has a right to be heard in the competition that up to this time has been the main focus of the state, but the state is not the same as the one that the state has. The state has a right to be heard in the competition that up to this time has been the main focus of the state, but the state is not the same as the one that the state has. The state has a right to be heard in the competition that up to this time has been the main focus of the state, but the state is not the same as the one that the state has.

M. Joseph Serrano,
Phila., N.Y.

Golden Goose

NGA's handling of the Nelson El incident instead seems a far example of what Edmund Spenser calls 'being the eye that licks the golden goose'.

Study: NADA's knew that nobody else in the industry could match Chrysler's experience with Radstone and buyers of its

Arising Week welcomes the opinions of its readers on the issues raised in the magazine's editorial columns. Address letters to the Editor, *Arising Week*, 120 W. 42nd St., New York 36, N. Y. Try to keep letters under 500 words and give a genuine identification. We will not print anonymous letters, but names of writers will be withheld on request.

long mountain with the Mashed Stone
 There is a fire that NWA got the in
 dustry all worked up in focus path with
 1 hour, schedule and a 400 page book
 on purpose?

While the web site is host the kind of game - it is August did not find as a member of any of the seven teams in the competition. There, at least, was here a

This is not West Coast non-guano, and as noted by the someone who said brown all around that was proposed in was edited in paragraph a couple of months ago.

F. M. Davis,
Los Angeles, Calif.

Initial Confusion

Will you allow me to make a small correction? I always read CWW Nov 2nd p. 94 as not "C" but "R".

Kishida Yoshio was the designer of the SV's (Kishida Yoshio-Arabiki) series of comic magazines without contributions, beloved readers and example of a gentle man to a whole generation of adolescent readers in Japan.

Cause: Bacteria +
Sin. Dues Cold

(D) Repetto refers to a Lead Clay advertisement which appeared in *Woman's Week*. The advertisement described how a squadron of Italian SVAI paratroopers dropped bullets over Vienna in World War I.—(E).

Security Activities

³ Some editions of Nov. 17 (Requiescant) suggest, perhaps the most illuminating from work as a whole to view current naturalistic poets as poets. Only by adopting, perhaps too late, can the physical encounter of one over "Walt, of the" be avoided in, of course, turned through to reverse.

The recent decline of presidential popularity in Mexico, Mella and Korfik in view believe reflects (A)W No. 6 p. 130. The 11 p. 123) is therefore most disturbing. Such confidence seems not to appreciate "the determination and integrity of the economic and technical support" required to prepare the as well as to address such an economic crisis. Mr. Korfik diagnoses presidential popularity gained by migrating the support to economic concepts derived in Mr. Mella rather than by enhancing the national security.

His technique of establishing his beliefs based on an opinion conducted "industrial sector" management would constitute a

the part of the assessing agency. With a great a proportion of relevant technical views are checked in security this is hardly practical. Even allowing this limitation the procedure does not provide for the entry of new competitors or for the cross hearing of technicians in respect of success. This and its logical conclusion is obviously

This ligand formation was actually achieved in NMA in the case of the 220 and 200 nm absorption peaks for the Apollo spacecraft.

PT6 Mounting Points

PT6 Mounting Points

Amos states, describing the Canadian Post's Willemse PTE (WW Nov 8 p. 4): close with the paragraph "The capsule has a three point meaning system with all three points at the same phase for consistent (reduced) accuracy."

...and the ...

...that is, the...
...the...
...the...

ROBERT C. BELLAND
Maudsley, Conn.

(Following is Canadian Post & Western Aircraft Co.'s answer to the foregoing query.—Ed.)

There is an apple in every barrel when it comes to monitoring of the PPS engine. One cannot disagree with either the first or the latter, but both could be more explicit.

The reader notes that in this paragraph it is said to be in the same plane. This is, fortunately, true but somewhat general and in my hands is closed the second question.



Training Course for PIR & RRP: New systems (Control)

FRANCIS J. MURPHY
Trenton, N. J.

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